

```
=> file reg
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FILE 'REGISTRY' ENTERED AT 09:38:05 ON 06 NOV 2003
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=> display history full 11-
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FILE 'REGISTRY' ENTERED AT 08:56:48 ON 06 NOV 2003

| | |
|-----|-----------------------------------|
| | E CHLORINE/CN |
| L1 | 1 SEA CHLORINE/CN |
| | E BROMINE/CN |
| L2 | 1 SEA BROMINE/CN |
| | E IODINE/CN |
| L3 | 1 SEA IODINE/CN |
| | E CALCIUM HYPOCHLORITE/CN |
| L4 | 1 SEA "CALCIUM HYPOCHLORITE"/CN |
| | E CALCIUM HYPOBROMITE/CN |
| L5 | 1 SEA "CALCIUM HYPOBROMITE"/CN |
| | E CALCIUM HYPOIODITE/CN |
| L6 | 1 SEA "CALCIUM HYPOIODITE"/CN |
| | D L4 SCAN |
| | E MAGNESIUM HYPOCHLORITE/CN |
| L7 | 1 SEA "MAGNESIUM HYPOCHLORITE"/CN |
| | E MAGNESIUM HYPOBROMITE/CN |
| | E MAGNESIUM HYPOIODITE/CN |
| | E BARIUM HYPOCHLORITE/CN |
| L8 | 1 SEA "BARIUM HYPOCHLORITE"/CN |
| | E BARIUM HYPOBROMITE/CN |
| L9 | 1 SEA "BARIUM HYPOBROMITE"/CN |
| | E BARIUM HYPOIODITE/CN |
| | E STRONTIUM HYPOCHLORITE/CN |
| L10 | 1 SEA "STRONTIUM HYPOCHLORITE"/CN |
| | E STRONTIUM HYPOBROMITE/CN |
| | E STRONTIUM HYPOIODITE/CN |

FILE 'HCA' ENTERED AT 09:08:49 ON 06 NOV 2003

| | |
|-----|---|
| L11 | 229121 SEA COAL? |
| L12 | 326574 SEA FLUEGAS## OR OFFGAS## OR WASTEGAS## OR (FLUE OR OFF OR WASTE# OR DISCHARG? OR EMISSION? OR EMIT? OR EMANAT?) (2A) GAS## OR EFFLUEN? OR EFFLUV? OR FUME# OR FUMING# OR EFFUS? OR EFFLUX? OR EFFUS? |
| L13 | 186830 SEA L1 OR L2 OR L3 OR (MOLECUL? OR ELEMENTAL? OR DIATOMIC?) (2A) (HALOGEN# OR CHLORINE# OR BROMIDE# OR IODINE#) OR CL2 OR BR2 OR I2 |
| L14 | 5334 SEA (L4 OR L5 OR L6 OR L7 OR L8 OR L9 OR L10) OR CLOH OR HOCL OR CLHO OR OHCL |
| L15 | 24588 SEA HYPOHALITE# OR HYPOCHLORITE# OR HYPOBROMITE# OR HYPOIODITE# |

FILE 'REGISTRY' ENTERED AT 09:15:54 ON 06 NOV 2003
 E MERCURY/CN

L16 1 SEA MERCURY/CN

FILE 'LCA' ENTERED AT 09:16:03 ON 06 NOV 2003

L17 2452 SEA (RECOVER? OR RECLAMAT? OR RECLAIM? OR RETRIEV? OR
 SALVAG? OR REGENERAT? OR RECONDITION? OR REFORM? OR
 RECONSTITUT? OR REUSE# OR REUSING# OR RECYCL? OR
 REPROCESS?) /BI, AB

L18 4 SEA (RE(W) (COVER? OR CLAMAT? OR CLAIM? OR GENERAT? OR
 CONDITION? OR FORM? OR CONSTITUT? OR USE# OR USING# OR
 CYCL? OR PROCESS?)) /BI, AB

L19 11074 SEA CAPTUR? OR SCRUB? OR EXTRACT? OR EXT# OR EXTN# OR
 FILTER? OR FILTRAT? OR ISOLAT? OR SEPARAT? OR SEP# OR
 SEPN# OR REMOV? OR EXTRICAT? OR STRIP? OR EXCIS?

FILE 'HCA' ENTERED AT 09:23:14 ON 06 NOV 2003

L20 13530 SEA (L17 OR L18 OR L19) (2A) (L16 OR MERCURY# OR HG)

L21 292 SEA L11 AND L12 AND L20

L22 28 SEA L21 AND L13

L23 2 SEA L21 AND L14

L24 2 SEA L21 AND L15

L25 3 SEA L23 OR L24

L26 26 SEA L22 NOT L25

L27 2 SEA L25 AND L22

L28 3 SEA L25 OR L27

FILE 'WPIX, JAPIO' ENTERED AT 09:31:10 ON 06 NOV 2003

L29 58051 SEA COAL?

L30 15959 SEA COAL?

TOTAL FOR ALL FILES

L31 74010 SEA COAL?

L32 128551 SEA FLUEGAS## OR OFFGAS## OR WASTEGAS## OR (FLUE OR OFF
 OR WASTE# OR DISCHARG? OR EMISSION? OR EMIT? OR EMANAT?) (2A)
 GAS## OR EFFLUEN? OR EFFLUV? OR FUME# OR FUMING# OR
 EFFUS? OR EFFLUX? OR EFFUS?

L33 47727 SEA FLUEGAS## OR OFFGAS## OR WASTEGAS## OR (FLUE OR OFF
 OR WASTE# OR DISCHARG? OR EMISSION? OR EMIT? OR EMANAT?) (2A)
 GAS## OR EFFLUEN? OR EFFLUV? OR FUME# OR FUMING# OR
 EFFUS? OR EFFLUX? OR EFFUS?

TOTAL FOR ALL FILES

L34 176278 SEA FLUEGAS## OR OFFGAS## OR WASTEGAS## OR (FLUE OR OFF
 OR WASTE# OR DISCHARG? OR EMISSION? OR EMIT? OR EMANAT?) (2A)
 GAS## OR EFFLUEN? OR EFFLUV? OR FUME# OR FUMING# OR
 EFFUS? OR EFFLUX? OR EFFUS?

L35 18754 SEA (MOLECUL? OR ELEMENTAL? OR DIATOMIC?) (2A) (HALOGEN#
 OR CHLORINE# OR BROMIDE# OR IODINE#) OR CL2 OR BR2 OR I2

L36 2964 SEA (MOLECUL? OR ELEMENTAL? OR DIATOMIC?) (2A) (HALOGEN#
 OR CHLORINE# OR BROMIDE# OR IODINE#) OR CL2 OR BR2 OR I2

TOTAL FOR ALL FILES

L37 21718 SEA (MOLECUL? OR ELEMENTAL? OR DIATOMIC?) (2A) (HALOGEN#
 OR CHLORINE# OR BROMIDE# OR IODINE#) OR CL2 OR BR2 OR I2

L38 6992 SEA CLOH OR HOCL OR CLHO OR OHCL OR HYPOHALITE# OR
HYPOCHLORITE# OR HYPOBROMITE# OR HYPOIODITE#
L39 1910 SEA CLOH OR HOCL OR CLHO OR OHCL OR HYPOHALITE# OR
HYPOCHLORITE# OR HYPOBROMITE# OR HYPOIODITE#
TOTAL FOR ALL FILES
L40 8902 SEA CLOH OR HOCL OR CLHO OR OHCL OR HYPOHALITE# OR
HYPOCHLORITE# OR HYPOBROMITE# OR HYPOIODITE#
L41 2409 SEA (L17 OR L19) (2A) (MERCURY# OR HG)
L42 546 SEA (L17 OR L19) (2A) (MERCURY# OR HG)
TOTAL FOR ALL FILES
L43 2955 SEA (L17 OR L19) (2A) (MERCURY# OR HG)
L44 32 SEA L29 AND L32 AND L41
L45 2 SEA L30 AND L33 AND L42
TOTAL FOR ALL FILES
L46 34 SEA L31 AND L34 AND L43
L47 2 SEA L44 AND (L35 OR L38)
L48 0 SEA L45 AND (L36 OR L39)
TOTAL FOR ALL FILES
L49 2 SEA L46 AND (L37 OR L40)

=> file wpix
FILE 'WPIX' ENTERED AT 09:39:04 ON 06 NOV 2003
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FILE LAST UPDATED: 5 NOV 2003 <20031105/UP>
MOST RECENT DERWENT UPDATE: 200371 <200371/DW>
DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

=> d 147 1-2 max

L47 ANSWER 1 OF 2 WPIX COPYRIGHT 2003 THOMSON DERWENT on STN
AN 2002-698105 [75] WPIX
DNN N2002-550544
TI **Mercury vapor removing process in coal**
fired boiler, involves oxidizing **flue gas** by
gas oxidizing agent at **gas oxidizing agent region** for
removing mercury vapor from flue
gas.
DC X11 X25
IN COLE, J A
PA (COLE-I) COLE J A
CYC 1
PI US 2002114749 A1 20020822 (200275)* 5p B01D053-64
ADT US 2002114749 A1 US 2000-745014 20001222
PRAI US 2000-745014 20001222
IC ICM B01D053-64
AB US2002114749 A UPAB: 20021120
NOVELTY - A **flue gas** is made to contact a **gas**
oxidizing agent at a **gas oxidizing agent region** so that the
flue gas is oxidized for **removing**

mercury vapor from flue gas.

USE - For removing mercury vapor from flue gas produced by combustion of coal and fossil fuels in coal-fired boiler, in generator and other combustion systems.

ADVANTAGE - Cheaply controls the mercury emitted during combustion of coal by decreasing the consumption of electrical power and the expense of controlling mercury vapor emissions.

DESCRIPTION OF DRAWING(S) - The figure shows a plot of mercury conversion as a function of gas temperature.

Dwg.1/1

TECH US 2002114749 A1UPTX: 20021120

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - The oxidizing agent is selected from chlorine, oxides of chlorine, H₂O₂, HOCl, compounds of chlorine, F₂, Br₂, I₂, Kr₂, H₂S, SO₃, H₂SO₄, CH₃SH and CH₂S.

FS EPI

FA AB; GI

MC EPI: X11-A09; X25-H02A

L47 ANSWER 2 OF 2 WPIX COPYRIGHT 2003 THOMSON DERWENT on STN

AN 1993-167449 [20] WPIX

DNC C1993-074640

TI Enhancing **mercury removal from coal**
combustion **flue-gas** - by adjusting chloride
concn. in spray drying absorption system.

DC E36 J01

IN CHRISTIANSEN, O; FELSVANG, K; NIELSEN, K; FELSVANG, K S;
CHRISTIANSEN, O B; NIELSEN, K K; OVE, B C

PA (NIRO) NIRO AS

CYC 18

PI WO 9308902 A1 19930513 (199320)* EN 27p B01D053-34

RW: AT BE CH DE DK ES FR GB GR IE IT LU MC NL SE
W: CA FI US

FI 9402058 A 19940504 (199428) B01D000-00

EP 613397 A1 19940907 (199434) EN B01D053-34

R: AT DE DK GB IT

EP 613397 B1 19950705 (199531) EN 12p B01D053-34

R: AT DE DK GB IT

US 5435980 A 19950725 (199535) 8p C01G013-04

DE 69203350 E 19950810 (199537) B01D053-34

FI 104413 B1 20000131 (200012) B01D053-34

CA 2121508 C 20020416 (200234) EN B01D053-34

ADT WO 9308902 A1 WO 1992-DK318 19921103; FI 9402058 A WO 1992-DK318

19921103, FI 1994-2058 19940504; EP 613397 A1 EP 1992-923706

19921103, WO 1992-DK318 19921103; EP 613397 B1 EP 1992-923706

19921103, WO 1992-DK318 19921103; US 5435980 A US 1991-787433

19911104; DE 69203350 E DE 1992-603350 19921103, EP 1992-923706

19921103, WO 1992-DK318 19921103; FI 104413 B1 WO 1992-DK318

19921103, FI 1994-2058 19940504; CA 2121508 C CA 1992-2121508

19921103, WO 1992-DK318 19921103

FDT EP 613397 A1 Based on WO 9308902; EP 613397 B1 Based on WO 9308902;
DE 69203350 E Based on EP 613397, Based on WO 9308902; FI 104413 B1
Previous Publ. FI 9402058; CA 2121508 C Based on WO 9308902
PRAI US 1991-787433 19911104
REP 1.Jnl.Ref; EP 1456; EP 253563; EP 254697; EP 405565; FR 2126361; GB
1336084; US 4619608
IC ICM B01D053-34; C01G013-04
ICS B01D053-50; B01D053-64
AB WO 9308902 A UPAB: 19931113
Flue gases at 110-170 deg.C from low chloride
coal combustion are fed to a drying chamber supplied with an
aq. suspension of basic absorbent from an atomiser. H₂O content of
the absorbent droplets formed evaporates with formation of fine dry
particulates. Droplets and particulates sorb oxides of sulphur and
nitrogen, hydrogen halides plus Hg from the **gas**. The
flue gas contg. entrained loaded absorbent is then
fed to a particle collector for gas/solid sepn. and cleaned
gas obtd. is **discharged**. Process is characterised
by keeping chloride concn. in the drying chamber above a min. concn.
to enhance Hg sequestration by the droplets/particulates of
absorbent.

Adjustment of chloride concn. is pref. by addn. of NaCl and/or
CaCl₂ or Cl₂ contg. material to the suspension or the
coal. Alternatively HCl can be added to the **flue**
gas. Activated carbon is also added to the **flue**
gas upstream of the particle collector to further improve
Hg removal. Chloride concn. in **fluegas**
can be estimated from the chloride content in the **coal** or
by measuring devices placed in the gas stream.

USE/ADVANTAGE - 90-99% of Hg in **flue gas**
can be removed by increasing chloride concn. in drying chamber to
20-150 ppm. **Hg removal** is compatible with
desulphurisation. Hg may be present as vapour, a cpd. or complex.
Dwg.0/1

ABEQ EP 613397 B UPAB: 19950810
A method for removing noxious components including sulphur dioxide
and mercury from a hot **flue gas** having a
temperature of 110-170 deg.C and resulting from the combustion of
coal having a low chloride content, in which process an
aqueous suspension of a basic absorbent in a drying chamber of a
drying-absorption zone comprising a drying chamber and a particle
collector as well as a duct connecting them, is atomized to fine
droplets into the hot **flue gas**, the water of
said droplets evaporates leaving dry fine particles, and a part of
noxious components of the gas including sulphur oxides, hydrogen
halides and nitrogen oxides and mercury, is simultaneously sorbed by
the droplets and the fine particles, whereupon the **flue**
gas with entrained dry fine particles is passed to the
particle collector wherein contact between the particles and the
flue gas causes a further sorption of noxious
compounds, in which the amount of chloride supplied to the
drying-absorption zone is increased to an extent sufficient to

improve the Hg sequestering capability of the process.

Dwg.0/1

ABEQ US 5435980 A UPAB: 19950905

Flue gas cleaning process is claimed for elemental Hg vapour contg. **flue gas** of temp.

110-170 deg.C resulting from combustion of **coal** having chloride control insufficient to convert elemental Hg vapour to HgCl₂. Aq. suspension of basic absorbent is atomised to fine droplets in the gas. The water of the droplets is evaporated to form dry fine basic absorbent particles. Part of noxious components in gas including SO_x, to H halides and NO_x and Hg is simultaneously absorbed by the basic to particles.

The **flue gas** with entrained dry absorbed particles passed to the particle collector when contact between the particles and **flue gas** cause further sorption of noxious components. The amt. of chloride applied to drying-absorbing zone is increased to a quality sufficient to convert elemental Hg to HgCl₂ to improve the sequestering of the droplets.

ADVANTAGE - Permanent high **Hg removal** is

achieved.

Dwg.0/1

FS CPI

FA AB; DCN

MC CPI: E11-Q02; E31-B03D; E31-F01A; E31-H02; E33-B; E34-D02; E35-E;
J01-E02A

DRN 1681-U; 1706-U; 1781-U; 1784-U; 1895-U; 1953-U

CMC UPB 19931202

M3 *01* C107 C108 C216 C307 C316 C520 C540 C730 C800 C801 C802 C803
C804 C805 C807 M411 M750 M903 M904 M910 Q431 Q436
DCN: R01784-X; R01953-X

M3 *02* A680 A940 C017 C100 C730 C801 C803 C804 C805 C806 C807 M411
M750 M903 M904 M910 Q431 Q436
DCN: R01681-X

M3 *03* A111 A220 A940 C017 C100 C730 C801 C803 C804 C805 C806 C807
M411 M781 M782 M903 M904 M910 Q431 Q436 Q508
DCN: R01706-M; R01706-R; R01895-M; R01895-R

M3 *04* C017 C100 C810 M411 M781 M782 M903 M904 M910 Q431 Q436 Q508
DCN: R01781-M; R01781-R

=> file hca

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=> d 128 1-3 cbib abs hitstr hitind

L28 ANSWER 1 OF 3 HCA COPYRIGHT 2003 ACS on STN

139:184655 Enhanced mercury control in **coal-fired** power plants. Oehr, Klaus H. (Can.). U.S. Pat. Appl. Publ. US 2003161771

A1 20030828, 7 pp. (English). CODEN: USXXCO. APPLICATION: US
2002-73986 20020214.

AB The present invention relates to a method of reducing the mercury emissions for coal-fired power plants. This method includes injecting a mol. halogen or thermolabile mol. halogen precursor able to decomp. to form mol. halogen at flue gas temp. The mol. halogen converts elemental mercury to mercuric halide adsorbable by alk. solids such as subbituminous or lignite coal ash, alkali fused bituminous coal ash capturable in whole or part by electrostatic precipitators (ESPs), baghouses (BHs), fabric filters (FFs), dry flue gas desulfurization solids, with or without subsequent adsorption by a liq. such as a flue gas desulfurization scrubbing liquor. Given examples show that it is possible to achieve dramatic mercury emission redn. through appropriate use of conventional installed equipment and techniques in combination with the teachings of the current invention.

IT 7553-56-2, Iodine, reactions 7726-95-6, Bromine,
reactions 7778-54-3, Calcium hypochlorite
7782-50-5, Chlorine, reactions

(enhanced mercury control in coal-fired power plants by injection of halogen and adsorption of resulting mercuric chloride)

RN 7553-56-2 HCA

CN Iodine (8CI, 9CI) (CA INDEX NAME)

I— I

RN 7726-95-6 HCA
CN Bromine (8CI, 9CI) (CA INDEX NAME)

Br— Br

RN 7778-54-3 HCA
CN Hypochlorous acid, calcium salt (8CI, 9CI) (CA INDEX NAME)

Cl— OH

1/2 Ca

RN 7782-50-5 HCA
CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl— Cl

IT 7553-56-2D, Iodine, compds. 7726-95-6D, Bromine,
compds. 7782-50-5D, Chlorine, compds.
(thermolabile; enhanced mercury control in **coal-fired**
power plants by injection of halogen and adsorption of resulting
mercuric chloride)

RN 7553-56-2 HCA
CN Iodine (8CI, 9CI) (CA INDEX NAME)

I--I

RN 7726-95-6 HCA
CN Bromine (8CI, 9CI) (CA INDEX NAME)

Br--Br

RN 7782-50-5 HCA
CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl--Cl

IC ICM B01D053-64
NCL 423210000
CC 59-4 (Air Pollution and Industrial Hygiene)
Section cross-reference(s): 51
ST **mercury removal** coal fired power plant
flue gas halogen; flue gas
mercury removal chlorine mercuric chloride
adsorption
IT **Flue gas** desulfurization
(alk. particles derived from; enhanced mercury control in
coal-fired power plants by injection of halogen and
adsorption of resulting mercuric chloride)
IT **Filters**
(bags; enhanced **mercury** control in **coal-fired**
power plants by injection of halogen and adsorption of resulting
mercuric chloride)
IT Ashes (residues)
(**coal**, subbituminous, lignite or alkali fused
bituminous **coal** ash; enhanced mercury control in
coal-fired power plants by injection of halogen and
adsorption of resulting mercuric chloride)
IT **Coal**, processes
(combustion of; enhanced mercury control in **coal-fired**
power plants by injection of halogen and adsorption of resulting
mercuric chloride)
IT Electrostatic precipitation
Electrostatic precipitation apparatus
Flue gases
(enhanced mercury control in **coal-fired** power plants by

injection of halogen and adsorption of resulting mercuric chloride)

IT **Hypochlorites**

(enhanced mercury control in coal-fired power plants by injection of halogen and adsorption of resulting mercuric chloride)

IT **Filters**

(fabric; enhanced mercury control in coal-fired power plants by injection of halogen and adsorption of resulting mercuric chloride)

IT Lime (chemical)

(mercuric halide adsorbent derived from flue gas desulfurization wastes; enhanced mercury control in coal-fired power plants by injection of halogen and adsorption of resulting mercuric chloride)

IT Adsorption

(of mercuric halides; enhanced mercury control in coal-fired power plants by injection of halogen and adsorption of resulting mercuric chloride)

IT **Flue gases**

(power-plant flue gases; enhanced mercury control in coal-fired power plants by injection of halogen and adsorption of resulting mercuric chloride)

IT Filtration

(using baghouse or fabric filters; enhanced mercury control in coal-fired power plants by injection of halogen and adsorption of resulting mercuric chloride)

IT 7553-56-2, Iodine, reactions 7726-95-6, Bromine, reactions 7778-54-3, Calcium hypochlorite

7782-50-5, Chlorine, reactions 7789-48-2, Magnesium bromide 10043-52-4, Calcium chloride, reactions 12298-68-9, Potassium triiodide

(enhanced mercury control in coal-fired power plants by injection of halogen and adsorption of resulting mercuric chloride)

IT 7439-97-6, Mercury, processes

(enhanced mercury control in coal-fired power plants by injection of halogen and adsorption of resulting mercuric chloride)

IT 7487-94-7, Mercuric chloride, processes

(mercuric halide adsorbent derived from flue gas desulfurization wastes; enhanced mercury control in coal-fired power plants by injection of halogen and adsorption of resulting mercuric chloride)

IT 471-34-1, Calcium carbonate, processes 1305-62-0, Calcium hydroxide, processes 1305-78-8, Calcium oxide, processes

(mercuric halide adsorbent derived from flue gas desulfurization wastes; enhanced mercury control in coal-fired power plants by injection of halogen and adsorption of resulting mercuric chloride)

IT 7553-56-2D, Iodine, compds. 7726-95-6D, Bromine,

compds. 7782-50-5D, Chlorine, compds.

(thermolabile; enhanced mercury control in coal-fired power plants by injection of halogen and adsorption of resulting mercuric chloride)

L28 ANSWER 2 OF 3 HCA COPYRIGHT 2003 ACS on STN

135:244758 Thermochemical study of mercury oxidation in utility boiler flue gases. Widmer, Neil C.; West, Janice; Cole, Jerald A. (GE Energy and Environmental Research Corporation, Irvine, CA, 92618, USA). Proceedings of the Air & Waste Management Association's Annual Conference & Exhibition, 93rd, Salt Lake City, UT, United States, June 18-22, 2000, 1601-1610. Air & Waste Management Association: Pittsburgh, Pa. (English) 2000. CODEN: 69BMLL.

AB Previous studies of **mercury capture** in wet scrubbers reported that over 80% mercury control was achieved for certain Municipal Waste Combustor configurations utilizing acid gas scrubbers. In general it was noted that high levels of **mercury capture** were obsd. in waste processing systems that did not employ a rapid **flue gas** quench directly after the primary combustion chamber. The performance data suggested that the rapid quench was interfering with the conversion of elemental mercury to the sol. $HgCl_2$ form, and therefore the acid gas scrubber could not effectively **capture** the **mercury**. A series of simple expts. were run to examine the impact of thermal quench rate on mercury oxidn. by chlorine species under MWC exhaust conditions. The results permitted development of a global reaction rate const. for mercury oxidn. Subsequent anal. of these data and the rate const. using thermochem. principles led to the development of a kinetic mechanism describing the reactions of mercury in the presence chlorine-contg. mols. and radical species. This mechanism predicts that the rate-limiting step in mercury oxidn. by chlorine is the Cl radical attack on elemental mercury. Subsequently the $HgCl$ radical can react quickly with even small concns. of mol. chlorine. Although reactions of $HgCl$ with HCl , Cl , or $HOCl$ are possible, they appear to be significantly slower in the temp. range of interest. The predicted rate const. for the initial attack of Cl on mercury was in the expected range of about 10^{16} cm 6 .cntdot.mol $^{-2}$.cntdot.s $^{-1}$. Under **coal**-fired utility conditions, however, HCl concns. are orders of magnitude lower than in MWCs, so that obsd. rates of mercury oxidn. are much slower. Application of the kinetic model to **coal** combustion conditions suggests limitations as well as opportunities for cost effective enhancement of **mercury capture** in utility boilers.

CC 51-18 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 59

ST flue gas mercury oxidn thermochem

IT **Flue gases**

(boiler; thermochem. of mercury oxidn. in utility boiler flue gases)

IT 7439-97-6, Mercury, processes
 (thermochem. of mercury oxidn. in utility boiler flue gases)

L28 ANSWER 3 OF 3 HCA COPYRIGHT 2003 ACS on STN
 129:152556 Waste gas treatment method and apparatus
 for removing extremely low concentration of mercury. Takao,
 Akikazu; Kanda, Masahiro; Inai, Yasuko; Ito, Shigeji; Marui,
 Kazuhito (Kawasaki Heavy Industries, Ltd., Japan). Jpn. Kokai
 Tokkyo Koho JP 10216476 A2 19980818 Heisei, 12 pp. (Japanese).
 CODEN: JKXXAF. APPLICATION: JP 1997-33055 19970131.

AB This waste gas treatment method comprises
 desulfurization for a waste gas contg. metal Hg
 vapor and SO₂ in a single tower type desulfurization app. and dust
 removal from the resultant waste gas: and a
 Hg removing agent is added to .gtoreq.1 of a
 circulated liq. in the tower, an absorption liq., water supplied to
 an elec. dust collector, circulated water of the dust collector,
 water in the collector main body, and the resultant waste
 gas at the inlet of the dust collector. Modified methods
 are also claimed. The Hg removing agent may be
 chelating agents. The app. for waste gas
 treatment comprises a single tower type desulfurization app., a wet
 type elec. dust collector, and a Hg removing
 agent supplying means connected with .gtoreq.1 of a circulated liq.
 pipe, an adsorption tower main body, a water supply pipe of the dust
 collector, a water circulating pipe, the dust collector main body,
 and a waste gas duct at the inlet of the dust
 collector. Hg vapor with concn. as low as 10 .mu.g/Nm³ level can be
 removed from a waste gas, esp. an incinerator
 flue gas.

IT 7553-56-2, Iodine, uses
 (mercury removing agent; mercury
 vapor removal in desulfurization treatment of
 waste gases by mercury
 removing agent)

RN 7553-56-2 HCA
 CN Iodine (8CI, 9CI) (CA INDEX NAME)

I—I

IC ICM B01D053-64
 ICS B01D053-34; B01D053-50; B01D053-77
 CC 59-4 (Air Pollution and Industrial Hygiene)
 ST mercury vapor removal waste
 gas treatment; flue gas mercury
 removal chelating agent
 IT Chelating agents
 (as mercury removing agent; mercury
 vapor removal in desulfurization treatment of
 waste gases by mercury

- removing agent)
- IT Ashes (residues)
 - (coal, mercury removing agent; mercury vapor removal in desulfurization treatment of waste gases by mercury removing agent)
- IT Flue gases
 - (incinerator; mercury vapor removal in desulfurization treatment of waste gases by mercury removing agent)
- IT Pyrite-group minerals
 - (mercury removing agent; mercury vapor removal in desulfurization treatment of waste gases by mercury removing agent)
- IT Flue gas desulfurization
 - (mercury vapor removal in desulfurization treatment of waste gases by mercury removing agent)
- IT 7440-44-0, Carbon, uses
 - (activated, mercury removing agent; mercury vapor removal in desulfurization treatment of waste gases by mercury removing agent)
- IT 1335-30-4, Aluminum silicate 1344-28-1, Alumina, uses 1344-67-8, Copper chloride 7440-50-8, Copper, uses 7553-56-2, Iodine, uses 7631-86-9, Silica, uses 7681-52-9, Sodium hypochlorite 7704-34-9, Sulfur, uses 7722-84-1, Hydrogen peroxide, uses 10043-52-4, Calcium chloride, uses 11126-12-8, Iron sulfide 11132-78-8, Manganese chloride 12040-57-2, Iron chloride 21055-93-6, Sodium diethylthiocarbamate 39377-56-5, Lead sulfide
 - (mercury removing agent; mercury vapor removal in desulfurization treatment of waste gases by mercury removing agent)
- IT 7446-09-5, Sulfurdioxide, processes
 - (removal; mercury vapor removal in desulfurization treatment of waste gases by mercury removing agent)
- IT 7439-97-6, Mercury, processes
 - (vapor removal; mercury vapor removal in desulfurization treatment of waste gases by mercury removing agent)

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L26 ANSWER 1 OF 26 HCA COPYRIGHT 2003 ACS on STN
139:294235 Predicting the levels and speciation of mercury in
coal-derived utility exhaust streams. Niksa, Stephen;
Fujiwara, Naoki (Niksa Energy Associates, Belmont, CA, 94002, USA).
Proceedings of the International Technical Conference on Coal
Utilization & Fuel Systems, 28th(Vol. 1), 199-210 (English) 2003.
CODEN: PTCSFT. Publisher: Coal Technology Association.

AB The Hg oxidn. mechanism features Hg oxidn. by gaseous Cl-species,
according to a 104-step mechanism that accounts for interaction
among all important exhaust species, and a heterogeneous oxidn.
mechanism on unburned carbon (UBC) particles, similar to established
chem. for dioxin prodn. under similar conditions. A sep.
mechanism for Hg adsorption on UBC enables predictions of
the levels and speciation of Hg compds. leaving particulate control
devices in most full-scale systems. Predictions from these
mechanisms for full-scale systems identify the most important
operating conditions in the furnace and exhaust system, including
SOx, COx, NOx, unburned carbon levels, and exhaust gas quench rate
and residence time, as well as the most important coal
properties, including coal-chlorine.

IT 7782-50-5, Chlorine, reactions
(predicting levels and speciation of mercury in coal
-derived utility exhaust streams)

RN 7782-50-5 HCA

CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl-Cl

CC 51-18 (Fossil Fuels, Derivatives, and Related Products)
ST speciation mercury coal utility flue gas
chlorine oxidn ash; heterogeneous surface reaction mechanism carbon
ash particle mercury model

IT Flue gases
(boiler; predicting levels and speciation of mercury in
coal-derived utility exhaust streams)

IT Ashes (residues)
(fly; predicting levels and speciation of mercury in coal
-derived utility exhaust streams)

IT Oxidation
(of mercury by Cl species; predicting levels and speciation of
mercury in coal-derived utility exhaust streams)

IT Adsorption
(of mercury species onto unburned carbon particulates; predicting
levels and speciation of mercury in coal-derived
utility exhaust streams)

IT Simulation and Modeling, physicochemical
(predicting levels and speciation of mercury in coal
-derived utility exhaust streams)

IT Coal, analysis
(predicting levels and speciation of mercury in coal
-derived utility exhaust streams)

IT Reaction mechanism
 (surface, interactions with ash, sorbents, and aerosols;
 predicting levels and speciation of mercury in **coal**
 -derived utility exhaust streams)

IT 7439-97-6, Mercury, analysis
 (predicting levels and speciation of mercury in **coal**
 -derived utility exhaust streams)

IT 11104-93-1, Nitrogen oxide, formation (nonpreparative) 12624-32-7,
 Sulfur oxide 12795-06-1, Carbon oxide
 (predicting levels and speciation of mercury in **coal**
 -derived utility exhaust streams)

IT 7439-97-6D, Mercury, compds.
 (predicting levels and speciation of mercury in **coal**
 -derived utility exhaust streams)

IT 7487-94-7, Mercury chloride ($HgCl_2$), formation (nonpreparative)
 (predicting levels and speciation of mercury in **coal**
 -derived utility exhaust streams)

IT 7546-30-7, Mercury chloride ($HgCl$)
 (predicting levels and speciation of mercury in **coal**
 -derived utility exhaust streams)

IT 7647-01-0, Hydrochloric acid, reactions
 (predicting levels and speciation of mercury in **coal**
 -derived utility exhaust streams)

IT 7782-50-5, Chlorine, reactions
 (predicting levels and speciation of mercury in **coal**
 -derived utility exhaust streams)

IT 7440-44-0, Carbon, processes
 (unburned, particles; predicting levels and speciation of mercury
 in **coal**-derived utility exhaust streams)

L26 ANSWER 2 OF 26 HCA COPYRIGHT 2003 ACS on STN

139:265033 Fixed-bed studies of the interactions between mercury and
coal combustion fly ash. Dunham, Grant E.; DeWall, Raymond
 A.; Senior, Constance L. (Energy and Environmental Research Center,
 Grand Forks, ND, 58203, USA). Fuel Processing Technology, 82(2-3),
 197-213 (English) 2003. CODEN: FPTEDY. ISSN: 0378-3820.
 Publisher: Elsevier Science B.V..

AB Sixteen different fly ash samples, generated from pilot- and
 full-scale combustion systems, were exposed to a simulated
flue gas contg. elemental **Hg** or $HgCl_2$ in a
 bench-scale reactor system at the Energy and Environmental Research
 Center to evaluate interactions and det. the effect of temp., **Hg**
 species, and ash type on adsorption of **Hg** and oxidn. of elemental
Hg. Fly ash was characterized for surface area, loss on ignition,
 and Fe forms in the ash. While many ash samples oxidized elemental
Hg, not all of samples that oxidized **Hg** also
 captured elemental **Hg**; however, no elemental
Hg capture was obsd. without accompanying oxidn.
 Generally, elemental **Hg** oxidn. increased with increasing amt. of
 magnetite in ash; however, 1 high-C subbituminous ash with no
 magnetite exhibited considerable **Hg** oxidn. which may have been due
 to unburned C. Surface area and the nature of the surface appeared

to be important for elemental Hg oxidn. and adsorption. The capacity of ash samples for HgCl₂ was similar to that for elemental Hg. There was a good correlation between the capacity for HgCl₂ and surface area; capacity decreased with increasing temp.

IT 7782-50-5, Chlorine, occurrence
 (coal contg.; fixed-bed studies of ash surface area and iron content effect on adsorption and oxidn. of mercury by coal fly ash at temps. characteristic of cold-side particulate collection devices)

RN 7782-50-5 HCA

CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl—Cl

CC 60-4 (Waste Treatment and Disposal)
 Section cross-reference(s): 51, 59

ST coal combustion fly ash adsorption elemental mercury mercury chloride; oxidn elemental mercury coal combustion fly ash; mercury chloride adsorption oxidn coal combustion fly ash; flue gas coal fired power generation mercury removal

IT Ferrites
 (calciun-magnesium, fly ash contg.; fixed-bed studies of ash surface area and iron content effect on adsorption and oxidn. of mercury by coal fly ash at temps. characteristic of cold-side particulate collection devices)

IT Flue gases
 (coal combustion; fixed-bed studies of ash surface area and iron content effect on adsorption and oxidn. of mercury by coal fly ash at temps. characteristic of cold-side particulate collection devices)

IT Ashes (residues)
 (coal fly; fixed-bed studies of ash surface area and iron content effect on adsorption and oxidn. of mercury by coal fly ash at temps. characteristic of cold-side particulate collection devices)

IT Power
 (coal-fired generation of; fixed-bed studies of ash surface area and iron content effect on adsorption and oxidn. of mercury by coal fly ash at temps. characteristic of cold-side particulate collection devices)

IT Air pollution
 (control; fixed-bed studies of ash surface area and iron content effect on adsorption and oxidn. of mercury by coal fly ash at temps. characteristic of cold-side particulate collection devices)

IT Adsorption
 Oxidation
 (elemental mercury; fixed-bed studies of ash surface area and iron content effect on adsorption and oxidn. of mercury by coal fly ash at temps. characteristic of cold-side

particulate collection devices)

IT Coal, uses
 (power generation from combustion of; fixed-bed studies of ash surface area and iron content effect on adsorption and oxidn. of mercury by coal fly ash at temps. characteristic of cold-side particulate collection devices)

IT 7782-50-5, Chlorine, occurrence
 (coal contg.; fixed-bed studies of ash surface area and iron content effect on adsorption and oxidn. of mercury by coal fly ash at temps. characteristic of cold-side particulate collection devices)

IT 7439-97-6, Mercury, processes
 (elemental; fixed-bed studies of ash surface area and iron content effect on adsorption and oxidn. of mercury by coal fly ash at temps. characteristic of cold-side particulate collection devices)

IT 7487-94-7, Mercury chloride ($HgCl_2$), processes
 (fixed-bed studies of ash surface area and iron content effect on adsorption and oxidn. of mercury by coal fly ash at temps. characteristic of cold-side particulate collection devices)

IT 124-38-9, Carbon dioxide, occurrence 7446-09-5, Sulfur dioxide, occurrence 7647-01-0, Hydrogen chloride, occurrence 7727-37-9, Nitrogen, occurrence 7732-18-5, Water, occurrence 7782-44-7, Oxygen, occurrence 10102-43-9, Nitric oxide, occurrence 10102-44-0, Nitrogen dioxide, occurrence
 (flue gas contg.; fixed-bed studies of ash surface area and iron content effect on adsorption and oxidn. of mercury by coal fly ash at temps. characteristic of cold-side particulate collection devices)

IT 1309-37-1, Ferric oxide, occurrence 1309-38-2, Magnetite, occurrence 1317-60-8, Hematite, occurrence 1345-25-1, Ferrous oxide, occurrence 11113-52-3, Calcium ferrite
 (fly ash contg.; fixed-bed studies of ash surface area and iron content effect on adsorption and oxidn. of mercury by coal fly ash at temps. characteristic of cold-side particulate collection devices)

L26 ANSWER 3 OF 26 HCA COPYRIGHT 2003 ACS on STN

139:247760 Arsenic and Mercury Partitioning in Fly Ash at a Kentucky Power Plant. Sakulpitakphon, Tanaporn; Hower, James C.; Trimble, Alan S.; Schram, William H.; Thomas, Gerald A. (Center for Applied Energy Research, University of Kentucky, Lexington, KY, 40511, USA). Energy & Fuels, 17(4), 1028-1033 (English) 2003. CODEN: ENFUEM.
 ISSN: 0887-0624. Publisher: American Chemical Society.

AB Coal and fly ash samples were collected from a 500-MW unit at a Kentucky power plant, with the objective of studying the distribution of arsenic, mercury, and other trace elements in fly ash. The coal feed was low-sulfur, high volatile A bituminous central West Virginia coal. The plant produced a relatively low-carbon fly ash. In contrast to power plants with high-mercury feed coal, the fly ashes from the

lower-mercury feed **coal** had low mercury values, generally not exceeding 0.01 ppm Hg. **Mercury capture** by fly ash varies with both the amt. and type of carbon and the collection temp.; **mercury capture** is more efficient at lower temps. Arsenic in the feed **coal** and in the **flue gas** is of concern to the utility, because of the potential for catalyst poisoning in the selective catalytic redn. system (in the planning stage at the time of the sampling). Arsenic is captured in the fly ash, increasing in concn. in the more-distant (from the boiler) reaches of the electrostatic precipitator system.

IT 7782-50-5, Chlorine, analysis
(in ashed **coal** feed; arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

RN 7782-50-5 HCA

CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl—Cl

CC 51-18 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 59, 60

ST arsenic mercury partition Bituminous **coal** fly ash power plant

IT Bituminous **coal**
(arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

IT Coal components
(cutinite; arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

IT Oxides (inorganic), analysis
(in ashed **coal** feed; arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

IT Coal components
(inertinite; arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

IT Coal components
(macrinite; arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

IT Coal components
(micrinite; arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

IT Coal components
(microlithotypes, trimacerite; arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

IT Iron ores, analysis
Sulfide ores
(pyritic, in **coal** feed; arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

IT Coal components
(semifusinite; arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

IT Coal components
 (sporinite; arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

IT 1305-78-8, Calcium oxide (CaO), analysis 1309-37-1, Iron oxide (Fe₂O₃), analysis 1309-48-4, Magnesium oxide (MgO), analysis 1313-59-3, Sodium oxide, analysis 1314-56-3, Phosphorus oxide (P₂O₅), analysis 1344-28-1, Alumina, analysis 7446-11-9, Sulfur trioxide, analysis 7631-86-9, Silica, analysis 12136-45-7, Potassium oxide, analysis 13463-67-7, Titanium oxide (TiO₂), analysis
 (in ashed coal feed and fly ash; arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

IT 7439-97-6, Mercury, analysis 7440-38-2, Arsenic, analysis
 (in ashed coal feed and fly ash; arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

IT 7782-50-5, Chlorine, analysis
 (in ashed coal feed; arsenic and mercury partitioning and trace metals in fly ash at Kentucky power plant)

L26 ANSWER 4 OF 26 HCA COPYRIGHT 2003 ACS on STN

138:275380 Mercury oxidation in coal-fired utility boilers:
 validation of gas-phase kinetic models. Senior, Constance; Chen, Zumao; Sarofim, Adel (Reaction Engineering International, Salt Lake City, UT, 84101, USA). Proceedings of the Air & Waste Management Association's Annual Conference & Exhibition, 95th, Baltimore, MD, United States, June 23-27, 2002, 443-460. Air & Waste Management Association: Pittsburgh, Pa. ISBN: 0-923204-45-8 (English) 2002.
 CODEN: 69DMAK.

AB Coal-fired power plants are major point sources of mercury discharges into the atm. After considerable study of mercury emissions and their impact on the environment, US EPA made a detn. to regulate mercury emissions from coal-fired elec. utility boilers. Regulation of mercury emissions may necessitate addnl. air pollution control devices being installed at utility power plants. Before regulations are imposed, it is important to understand the behavior of mercury in existing devices. Extensive measurements of mercury emissions at power plants demonstrated that high levels of removal can occur in existing devices and that the partitioning of mercury between elemental and oxidized forms in the gas plays an important role in mercury removal. Also, the effectiveness of proposed methods for mercury control such as injection of powd. activated carbon, depends on the form of mercury in the gas. Oxidn. of elemental mercury as it leaves the combustion zone can occur by homogeneous and heterogeneous pathways. Homogeneous oxidn. appears to be kinetically limited in coal-fired boilers and to involve reaction between mercury and chlorine species. The authors describe a kinetic scheme for chlorine and mercury chem. in flue gas. The kinetic model for the behavior of chlorine compds. in flue gas was validated against exptl. data. The model does a good job of reproducing the evolution of chlorine as a function of residence time. Also, the model reproduces the prodn. of Cl₂ over a

wide range of cooling rates. For the purposes of modeling Hg, the authors need to have the correct compns. of the important chlorine radicals. The paper showed the importance of starting the calcns. at high enough temps. to obtain the correct initial conditions of Cl radical, and the secondary importance of water vapor. The model was used to simulate six different sets of exptl. data in which chlorine and mercury compds. were combined at elevated temps. Comparisons with expts. showed the correct trends and, in many cases, the correct magnitudes. The biggest differences are found at low temps. For the practically important case of **coal** combustion with different **coals** the model performed well.

IT 7782-50-5, Chlorine, reactions
 (mercury oxidn. in presence of chlorine in **flue gas of coal-fired boilers**)
 RN 7782-50-5 HCA
 CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl-Cl

CC 59-4 (Air Pollution and Industrial Hygiene)
 Section cross-reference(s): 51
 ST mercury oxidn **flue gas chlorine coal**
 fired boiler model
 IT Boilers
 (**coal-fired; mercury oxidn. in presence of chlorine in flue gas of coal-fired boilers**)
 IT Air pollution
 (control; mercury oxidn. in presence of chlorine in **flue gas of coal-fired boilers**)
 IT **Flue gases**
 Metal speciation
 Oxidation
 Simulation and Modeling, physicochemical
 (mercury oxidn. in presence of chlorine in **flue gas of coal-fired boilers**)
 IT 7782-50-5, Chlorine, reactions
 (mercury oxidn. in presence of chlorine in **flue gas of coal-fired boilers**)
 IT 7439-97-6, Mercury, reactions
 (mercury oxidn. in presence of chlorine in **flue gas of coal-fired boilers**)
 IT 7647-01-0, Hydrochloric acid, reactions 7732-18-5, Water,
 reactions 22537-15-1, Chlorine atomic, reactions
 (mercury oxidn. in presence of chlorine in **flue gas of coal-fired boilers**)

L26 ANSWER 5 OF 26 HCA COPYRIGHT 2003 ACS on STN
 138:157911 Iodine room temperature sorbents for **mercury capture** in combustion exhausts. Rodriguez, Sylian J.; Lee, Tai-Gyu; Hedrick, Elizabeth; Biswas, Pratim (Aerosol and Air Quality Research Laboratory, Department of Civil and Environmental

Engineering, University of Cincinnati, Cincinnati, OH, 45221-0071, USA). Proceedings - U.S. EPA-DOE-EPRI Combined Power Plant Air Pollution Control Symposium: The Mega Symposium and the A&WMA Specialty Conference on Mercury Emissions: Fate, Effects, and Control, Chicago, IL, United States, Aug. 21-23, 2001, Volume 2, 38/1-38/13. Air & Waste Management Association: Pittsburgh, Pa. (English) 2001. CODEN: 69DHKF.

AB Novel sorbent processes at room temp. were studied for their feasibility for **mercury capture** in gas streams. During the development of impinger solns. for efficient **removal of mercury** for measurement by direct injection nebulization ICP/MS36, potassium iodide solns. are very effective at **capturing** elemental **mercury**. Potassium iodide aerosols, com. available KI crystals and iodine gas highly **removed mercury**. The first phase was to characterize the as generated sorbent particles by structural and morphol. anal., and the second phase focused on the capture efficiencies. Rather high capture efficiencies (> 98%) of elemental mercury were obtained using the potassium iodide sorbent particles, due to the submicrometer particles with high surface area in which Hg vapors were condensed and oxidized. Agglomerated sorbent particles with high surface area per unit mass were generated by nebulizing potassium iodide solns. The **mercury removal** was weakly diminished by the addn. of more Hg in the gas phase, but still high capture efficiencies were obtained (.apprx. 93%). KI crystals com. available were used over a filter and over a mesh, simulating a fixed bed reactor. Efficiencies varied from 72.6% to 93.2%, showing the potential of KI powders to be used as efficient granular sorbents of mercury vapors. Iodine gas, generated from a KI soln. with acidified hydrogen peroxide, also efficiently oxidizes elemental mercury in gas streams, .ltoreq.99.4%.

IT 7553-56-2, Iodine, reactions
(oxidant; **mercury removal** from combustion flue gases using iodine/potassium iodide as sorbent)

RN 7553-56-2 HCA
CN Iodine (8CI, 9CI) (CA INDEX NAME)

I-I

CC 59-4 (Air Pollution and Industrial Hygiene)
Section cross-reference(s): 51
ST **mercury removal** combustion flue
gas iodine potassium iodide sorption
IT Aerosols
(KI; **mercury removal** from combustion
flue gases using iodine/potassium iodide as
sorbent)
IT Air pollution
(control; **mercury removal** from combustion

flue gases using iodine/potassium iodide as sorbent)
 IT Coal, uses (flue gas from combustion of; mercury removal from combustion flue gases using iodine/potassium iodide as sorbent)
 IT Flue gases (incinerator; mercury removal from combustion flue gases using iodine/potassium iodide as sorbent)
 IT Filters
 Flue gases
 Sorption (mercury removal from combustion flue gases using iodine/potassium iodide as sorbent)
 IT 7439-97-6, Mercury, processes (mercury removal from combustion flue gases using iodine/potassium iodide as sorbent)
 IT 7553-56-2, Iodine, reactions (oxidant; mercury removal from combustion flue gases using iodine/potassium iodide as sorbent)
 IT 7722-84-1, Hydrogen peroxide, reactions (oxidant; mercury removal from combustion flue gases using iodine/potassium iodide as sorbent)
 IT 7681-11-0, Potassium iodide, uses (sorbent; mercury removal from combustion flue gases using iodine/potassium iodide as sorbent)

L26 ANSWER 6 OF 26 HCA COPYRIGHT 2003 ACS on STN
 138:157898 Mercury emissions and removal during co-firing of coal, wood and wastes. Kouvo, Petri, Korelin, Toni; Savola, Tuula (Fortum Power and Heat, Vantaa, 00048, Finland). Proceedings - U.S. EPA-DOE-EPRI Combined Power Plant Air Pollution Control Symposium: The Mega Symposium and the A&WMA Specialty Conference on Mercury Emissions: Fate, Effects, and Control, Chicago, IL, United States, Aug. 21-23, 2001, Volume 2, 5/1-5/13. Air & Waste Management Association: Pittsburgh, Pa. (English) 2001. CODEN: 69DHKF.

AB Interest on reducing Hg emissions rose in the USA after USEPA decided Hg emissions from power plants will be regulated. Also, the European Union proposal for a waste combustion directive would regulate Hg emissions from waste incinerators and co-combustion. Hg emissions are esp. interesting when fuels with different qualities are co-fired. Co-firing refuse-derived fuel (RDF) and wood in a pilot-scale bubbling fluidized bed (BFB) boiler and co-firing coal and wood in a full-scale pulverized coal-fired boiler were studied. These studies detd. changes in Hg emissions and performance of flue gas cleaning equipment during co-combustion. Co-firing expts. with RDF and wood

were made at a pilot-scale BFB plant equipped with fabric filter. During expts. Hg removal in fabric filter increased significantly as RDF and Hg content in the fuel mixt. increased. This was mainly due to high Cl concns. in RDF, resulting in high ratios of oxidized Hg species. Injecting CaCO₃ into the flue gas duct significantly increased the ratio of particulate Hg upstream from the fabric filter. The effect of coal and wood co-firing on Hg emissions was experimented at a 315 MWfuel pulverized coal-fired unit with an electrostatic precipitator and a wet flue gas desulfurization plant. During the expts. Hg emissions decreased clearly, .apprx.20%, when some of coal (4% of fuel energy input) was replaced with wood. The most important reason for the redn. was the usually lower Hg concn. in wood fuel vs. coal ; however, increased Hg removal in the wet flue gas desulfurization plant was obsd. during wood co-firing.

IT 7782-50-5, Chlorine, occurrence
 (flue gas contg.; flue gas mercury emissions and air pollution control equipment removal during co-firing of coal, wood, and refuse-derived fuels in bubbling fluidized bed and pulverized coal boilers)
 RN 7782-50-5 HCA
 CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl—Cl

CC 59-4 (Air Pollution and Industrial Hygiene)
 Section cross-reference(s): 43, 51, 60
 ST flue gas mercury coal wood refuse
 derived fuel cocombustion; pulverized coal fired boiler
 wood coal cocombustion; bubbling fluidized bed boiler wood
 refuse derived fuel cocombustion; cocombustion flue
 gas cleaning equipment performance; calcium carbonate
 injection flue gas mixed fuel combustion;
 chlorine effect mercury removal mixed fuel
 combustion flue gas; fabric filter wet
 scrubbing mercury removal combustion
 flue gas
 IT Filters
 (fabric, mercury removal in; flue
 gas mercury emissions and air pollution control
 equipment removal during co-firing of coal, wood, and
 refuse-derived fuels in bubbling fluidized bed and pulverized
 coal boilers)
 IT Flue gases
 (flue gas mercury emissions and air
 pollution control equipment removal during co-firing of
 coal, wood, and refuse-derived fuels in bubbling
 fluidized bed and pulverized coal boilers)

IT Wet scrubbing
(mercury removal by; flue gas mercury emissions and air pollution control equipment removal during co-firing of coal, wood, and refuse-derived fuels in bubbling fluidized bed and pulverized coal boilers)

IT Furnace firing
(mixed fuel; flue gas mercury emissions and air pollution control equipment removal during co-firing of coal, wood, and refuse-derived fuels in bubbling fluidized bed and pulverized coal boilers)

IT Sawdust
Wood
(refuse-derived fuel co-combustion with; flue gas mercury emissions and air pollution control equipment removal during co-firing of coal, wood, and refuse-derived fuels in bubbling fluidized bed and pulverized coal boilers)

IT Refuse derived fuels
(wood co-combustion with; flue gas mercury emissions and air pollution control equipment removal during co-firing of coal, wood, and refuse-derived fuels in bubbling fluidized bed and pulverized coal boilers)

IT Coal, uses
(wood co-combustion with; flue gas mercury emissions and air pollution control equipment removal during co-firing of coal, wood, and refuse-derived fuels in bubbling fluidized bed and pulverized coal boilers)

IT 7782-50-5, Chlorine, occurrence
(flue gas contg.; flue gas mercury emissions and air pollution control equipment removal during co-firing of coal, wood, and refuse-derived fuels in bubbling fluidized bed and pulverized coal boilers)

IT 7439-97-6, Mercury, processes
(gaseous and particulate; flue gas mercury emissions and air pollution control equipment removal during co-firing of coal, wood, and refuse-derived fuels in bubbling fluidized bed and pulverized coal boilers)

IT 471-34-1, Calcium carbonate, uses
(sorbent; injection of; flue gas mercury emissions and air pollution control equipment removal during co-firing of coal, wood, and refuse-derived fuels in bubbling fluidized bed and pulverized coal boilers)

coal combustor using iodine based impingers and direct injection nebulization - inductively coupled plasma mass spectrometry analysis. Hedrick, Elizabeth; Biswas, Pratim; Lee, Tai Gyu; Zhuang, Ye (U.S. EPA, USA). Proceedings of the Air & Waste Management Association's Annual Conference & Exhibition, 94th, Orlando, FL, United States, June 24-28, 2001, 1457-1470. Air & Waste Management Association: Pittsburgh, Pa. ISBN: 0-923204-39-3 (English) 2001. CODEN: 69DMIS.

AB Hg emissions from **coal** utilities are difficult to control.

Hg eludes **capture** by most air pollution control devices (APCDs). To det. the gaseous Hg species in stack gases, U.S. EPA Method 5 type sampling was used. In this type of sampling a hole is drilled into the stack wall and a vol. of gas is isokinetically drawn through a heated probe, through a filter to remove particulate, and finally through gas-scrubbing solns. designed to selectively **capture** the gaseous **Hg** species of interest. Gaseous speciation is achieved by selective, sequential capture in the impinger solns. Anal. of **Hg** on the **filter** and in the impinger solns. is done by oxidn. of all Hg species followed by cold vapor at. absorption spectrometry (CVAA) anal. A drawback to this type of anal. scheme is that there are no ref. methods capable of both Hg speciation and multiple metals anal. since the solns. typically used for **Hg** **capture** are not amenable to low-level metals techniques like ICP-MS. This can double the cost of study designed to gather Hg and multiple metals data since two sep. sampling and anal. methods must be used. In previous research the authors developed an impinger sampling train for Hg speciation using inductively coupled plasma mass spectrometry (ICP/MS) with direct injection nebulization (DIN) with the potential for performing multiple metals detns. on the same solns. In the current work the authors demonstrate the Hg speciation sampling and anal. method using a bench scale **coal** combustor and compare the results to the Ontario Hydro Method, and demonstrate the capability of performing low-level Hg detn. in addn. to low-level anal. of Pb, Cd, Ba, Cr, Cu, Mn, Ni, Se, V and Zn.

IT 7553-56-2, Iodine, analysis

(the detn. of mercury species in a bench scale **coal** combustor using iodine based impingers and direct injection nebulization - inductively coupled plasma mass spectrometry anal.)

RN 7553-56-2 HCA

CN Iodine (8CI, 9CI) (CA INDEX NAME)

I-I

CC 59-1 (Air Pollution and Industrial Hygiene)

ST mercury detn **coal** combustor iodine based impinger ICP MS

IT Mass spectrometry

(inductively coupled plasma; the detn. of mercury species in a bench scale **coal** combustor using iodine based impingers

and direct injection nebulization - inductively coupled plasma mass spectrometry anal.)

IT Combustion apparatus

Flue gases

(the detn. of mercury species in a bench scale **coal** combustor using iodine based impingers and direct injection nebulization - inductively coupled plasma mass spectrometry anal.)

IT Coal, processes

(the detn. of mercury species in a bench scale **coal** combustor using iodine based impingers and direct injection nebulization - inductively coupled plasma mass spectrometry anal.)

IT 7439-97-6, Mercury, analysis

(the detn. of mercury species in a bench scale **coal** combustor using iodine based impingers and direct injection nebulization - inductively coupled plasma mass spectrometry anal.)

IT 7553-56-2, Iodine, analysis

(the detn. of mercury species in a bench scale **coal** combustor using iodine based impingers and direct injection nebulization - inductively coupled plasma mass spectrometry anal.)

L26 ANSWER 8 OF 26 HCA COPYRIGHT 2003 ACS on STN

138:141480 Analysis of ICR data for **mercury removal**

from wet and dry FGD. Weilert, Carl V.; Randall, Douglas W. (Burns & McDonnell, Kansas City, MO, 64114, USA). Proceedings - U.S. EPA-DOE-EPRI Combined Power Plant Air Pollution Control Symposium: The Mega Symposium and the A&WMA Specialty Conference on Mercury Emissions: Fate, Effects, and Control, Chicago, IL, United States, Aug. 21-23, 2001, Volume 1, 45/1-45/15. Air & Waste Management Association: Pittsburgh, Pa. (English) 2001. CODEN: 69DHKF.

AB USEPA posted summaries of Hg emission test data from the Information Collection Rule (ICR) for elec. utility units indicated a wide range of **Hg removal** efficiency for wet and dry **flue gas** desulfurization (FGD) systems. For example, total **Hg removal** efficiency for units equipped with dry scrubbers reportedly was from <9 to >98%. The range of efficiencies reported for units equipped with wet FGD systems was from <13 to >96%. For utilities contemplating construction of new **coal**-fired steam-elec. generating units, uncertainty raised by the posted data summaries is problematic. Results of a review of ICR data conducted to evaluate possible reasons for the disparity among **Hg removal** efficiency within populations of wet and dry FGD systems tested are presented. Variables evaluated included fuel parameters (**coal** rank, S, moisture, ash, Cl, Hg) and stack gas parameters (Hg speciation, O₂ content). Major factors to explain variations in **Hg removal** efficiency performance from one FGD system to another included **coal** rank and Hg speciation in **flue gas** entering the

IT FGD system.
7782-50-5, Chlorine, occurrence
(coal contg.; coal properties and
flue gas compn. effect on mercury
removal from coal-fired power generation
flue gas in wet and dry desulfurization systems
detd. by analyzing Information Collection rule data)
RN 7782-50-5 HCA
CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl-Cl

CC 59-4 (Air Pollution and Industrial Hygiene)
Section cross-reference(s): 51
ST mercury removal wet dry flue
gas desulfurization system; coal fired power
generation flue gas mercury emission;
fuel property flue gas compn effect
mercury removal desulfurization
IT Standards, legal and permissive
(air quality; coal properties and flue
gas compn. effect on mercury removal
from coal-fired power generation flue
gas in wet and dry desulfurization systems detd. by
analyzing Information Collection rule data)
IT Ashes (residues)
(coal contg.; coal properties and
flue gas compn. effect on mercury
removal from coal-fired power generation
flue gas in wet and dry desulfurization systems
detd. by analyzing Information Collection rule data)
IT Flue gas desulfurization
Flue gases
Wet scrubbing
(coal properties and flue gas
compn. effect on mercury removal from
coal-fired power generation flue gas
in wet and dry desulfurization systems detd. by analyzing
Information Collection rule data)
IT Power
(coal-fired generation of; coal properties
and flue gas compn. effect on mercury
removal from coal-fired power generation
flue gas in wet and dry desulfurization systems
detd. by analyzing Information Collection rule data)
IT Air pollution
(control; coal properties and flue
gas compn. effect on mercury removal
from coal-fired power generation flue
gas in wet and dry desulfurization systems detd. by
analyzing Information Collection rule data)

IT Filters
(fabric, mercury removal; coal properties and flue gas compn. effect on mercury removal from coal-fired power generation flue gas in wet and dry desulfurization systems detd. by analyzing Information Collection rule data)

IT Metal speciation
(mercury; coal properties and flue gas compn. effect on mercury removal from coal-fired power generation flue gas in wet and dry desulfurization systems detd. by analyzing Information Collection rule data)

IT Bituminous coal
Lignite
Subbituminous coal
(power generation from combustion of; coal properties and flue gas compn. effect on mercury removal from coal-fired power generation flue gas in wet and dry desulfurization systems detd. by analyzing Information Collection rule data)

IT Absorption
(spray dryer; coal properties and flue gas compn. effect on mercury removal from coal-fired power generation flue gas in wet and dry desulfurization systems detd. by analyzing Information Collection rule data)

IT 7704-34-9, Sulfur, occurrence 7782-50-5, Chlorine, occurrence
(coal contg.; coal properties and flue gas compn. effect on mercury removal from coal-fired power generation flue gas in wet and dry desulfurization systems detd. by analyzing Information Collection rule data)

IT 7446-09-5, Sulfur dioxide, processes 14302-87-5, Hg²⁺, processes
(coal properties and flue gas compn. effect on mercury removal from coal-fired power generation flue gas in wet and dry desulfurization systems detd. by analyzing Information Collection rule data)

IT 7439-97-6, Mercury, processes
(elemental and particulate; coal properties and flue gas compn. effect on mercury removal from coal-fired power generation flue gas in wet and dry desulfurization systems detd. by analyzing Information Collection rule data)

L26 ANSWER 9 OF 26 HCA COPYRIGHT 2003 ACS on STN
138:141479 Assessment of mercury removal by existing air pollution control devices in full scale power plants. Afonso, Rui F.; Senior, Constance L. (Energy and Environmental Strategies, MA, USA). Proceedings - U.S. EPA-DOE-EPRI Combined Power Plant Air

Pollution Control Symposium: The Mega Symposium and the A&WMA Specialty Conference on Mercury Emissions: Fate, Effects, and Control, Chicago, IL, United States, Aug. 21-23, 2001, Volume 1, 44/1-44/17. Air & Waste Management Association: Pittsburgh, Pa. (English) 2001. CODEN: 69DHKF.

AB Coal-fired power facilities are major point sources of Hg discharges to the atm. USEPA regulates Hg emissions, necessitating controls on some utility boilers. The USEPA Hg Information Collection Request (ICR) initiated in 1999 was designed to provide data to help make future regulatory detns. to control Hg emissions from coal-fired power facilities. Phase III of this effort involved a plant testing program for Hg emissions, including Hg speciation from coal-fired power facilities. More than 80 facilities were statistically selected for this testing based on several factors, including boiler type, air pollution control equipment configuration, and fuel type. For each facility, Hg concns. were measured in coal (along with other coal compn. data) and flue gas.

Flue gas measurements were conducted at the stack and inlet to the last air pollution control device (APCD) using the Ontario Hydro method, providing Hg speciation data (elemental, oxidized, particulate-bound). A simple model for Hg transformations in coal-fired power plants was devised to predict Hg concn. and speciation within APCD and at the stack. This model used a kinetic approach to predict oxidn. of gas-phase Hg in the convective section, based on key Hg reactions in flue gas. ICR data on Hg speciation in flue gas, coal compn., and boiler design and operation were examd. to assess trends in the behavior of Hg in coal-fired power facilities. Hg speciation at the inlet to particulate control devices depended on coal Cl content and on the temp. at the inlet to the device. Wet flue gas desulfurization, dry scrubbers, and fabric filters can all remove a significant amt. (50-90%) of Hg from flue gas under certain conditions. Crit. information was missing from ICR data, particularly fly ash compn.; lack of this information reduced model prediction quality.

IT 7782-50-5, Chlorine, occurrence
 (coal contg.; model assessment of coal property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, coal-fired power generation flue gas by air pollution control devices)

RN 7782-50-5 HCA
 CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl-Cl

CC 59-4 (Air Pollution and Industrial Hygiene)
 Section cross-reference(s): 51
 ST modeling mercury removal existing air pollution

control device; coal fired power generation facility
mercury removal flue gas;
speciation mercury coal fired power generation
flue gas

IT Standards, legal and permissive
(air quality; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT Ashes (residues)
(**coal** contg.; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT Power
(**coal**-fired generation of; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT **Flue gases**
(**coal**-fired power generation; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT Air pollution
(control; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT Absorption
Scrubbers
(dry; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT Filters
(fabric; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT Electrostatic precipitation apparatus
(hot- and cold-side; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution

control devices)

IT Metal speciation
(mercury; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT **Flue gas** desulfurization
Simulation and Modeling, physicochemical
(model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT Bituminous **coal**
Lignite
Subbituminous **coal**
(power generation; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT Scrubbers
(wet; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT 7782-50-5, Chlorine, occurrence
(**coal** contg.; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT 7439-97-6, Mercury, occurrence
(elemental; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT 7446-09-5, Sulfur dioxide, processes
(**flue gas**; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT 7647-01-0, Hydrogen chloride, occurrence 11104-93-1, Nitrogen oxide, occurrence
(**flue gas**; model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal**-fired power generation **flue gas** by air pollution control devices)

IT 14302-87-5, Hg²⁺, occurrence
 (model assessment of **coal** property, temp., reaction time, and facility operations effect on mercury speciation in and removal from full-scale, **coal-fired** power generation **flue gas** by air pollution control devices)

L26 ANSWER 10 OF 26 HCA COPYRIGHT 2003 ACS on STN
 138:141465 Wet electrostatic precipitation demonstrating multiple pollutant control in industrial applications holds promise for **coal-fired** utility emission reduction of acid mist, PM2.5 and mercury. Altman, Ralph; Buckley, Wayne; Ray, Isaac (EPRI, USA). Proceedings - U.S. EPA-DOE-EPRI Combined Power Plant Air Pollution Control Symposium: The Mega Symposium and the A&WMA Specialty Conference on Mercury Emissions: Fate, Effects, and Control, Chicago, IL, United States, Aug. 21-23, 2001, Volume 2, 29/1-29/10. Air & Waste Management Association: Pittsburgh, Pa. (English) 2001. CODEN: 69DHKF.

AB Wet electrostatic pptn. (ESP) technol. is used in industrial applications to control acid mists, sub-micron particulate, Hg, metals, and dioxins/furans as a final polishing device in a multi-pollutant air pollution control system. Test results from facilities meeting new USEPA max. achievable control technol. stds. demonstrated .gtoreq.99.9% removal efficiency and 0 opacity. How wet ESP work, what configurations they come in, design considerations, and how this technol. is being piloted in **coal-fired** utilities to control SO₃ and PM2.5 emissions is also discussed.

IT 7782-50-5, Chlorine, processes
 (wet electrostatic pptn. to control multiple pollutant emissions in **coal-fired** power generation **flue gas**)

RN 7782-50-5 HCA
 CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

C1-C1

CC 59-4 (Air Pollution and Industrial Hygiene)
 Section cross-reference(s): 51

ST wet electrostatic precipitator **flue gas**
 pollutant **emission** control; **coal** fired power generation **flue gas** pollutant **emission** control; acid mist particulate matter **mercury** removal **flue gas**

IT Power
 (**coal-fired** generation of; wet electrostatic pptn. to control multiple pollutant emissions in **coal-fired** power generation **flue gas**)

IT **Flue gases**
 (**coal-fired** power generation; wet electrostatic pptn. to control multiple pollutant emissions in **coal-fired** power generation **flue gas**)

IT Coal, uses
 (power generation from combustion of; wet electrostatic pptn. to control multiple pollutant emissions in **coal-fired power generation flue gas**)

IT Particles
 (wet electrostatic pptn. to control multiple pollutant emissions in **coal-fired power generation flue gas**)

IT Metals, processes
 (wet electrostatic pptn. to control multiple pollutant emissions in **coal-fired power generation flue gas**)

IT Electrostatic precipitation apparatus
 (wet; tubular or plate; wet electrostatic pptn. to control multiple pollutant emissions in **coal-fired power generation flue gas**)

IT 132-64-9D, Dibenzofuran, chloro derivs. 262-12-4D, Dibenzo-p-dioxin, chloro derivs. 7439-92-1, Lead, processes 7439-97-6, Mercury, processes 7440-47-3, Chromium, processes 7446-09-5, Sulfur dioxide, processes 7446-11-9, Sulfur trioxide, processes 7647-01-0, Hydrogen chloride, processes 7664-93-9, Sulfuric acid, processes 7782-50-5, Chlorine, processes
 (wet electrostatic pptn. to control multiple pollutant emissions in **coal-fired power generation flue gas**)

L26 ANSWER 11 OF 26 HCA COPYRIGHT 2003 ACS on STN

138:111299 A method and a device for the separation of sulphur dioxide from a gas. Bengtsson, Sune; Johanson, Lars-Erik; Nolin, Kjell; Maripuu, Mati (Alstom (Switzerland) Ltd., Switz.). PCT Int. Appl. WO 2003004137 A1 20030116, 34 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2002-SE1333 20020704. PRIORITY: SE 2001-2412 20010705.

AB A device for sepg. sulfur dioxide from a gas has an inlet for the gas and an outlet for gas, from which sulfur dioxide has been sepd. An apertured plate is arranged between the inlet and the outlet and allows the gas to pass from below. On its upper side, the apertured plate supports a flowing layer of absorption liq. An inlet duct connects a container for absorption liq. to the upper side of the apertured plate. A means conveys the absorption liq. from the container, through the inlet duct, to the upper side of the apertured plate and along the apertured plate. The device also has an outlet box for collecting the absorption liq. flowing over the apertured plate and at least one distribution means, which is

arranged to contact the gas which is supplied to the device through the inlet with the liq. flowing from the outlet box to the container before the gas passes through the apertured plate. The device can be used with: boiler firing with **coal**, oil, peat, biofuel and waste, such as industrial and domestic waste; metallurgical processes, such as steel and copper making processes; concrete prodn. processes and refining processes, such as oil refinement and natural gas refinement. The device can also be used for absorbing other substances together with sulfur dioxide, including: hydrogen halogenides, such as hydrogen chloride, hydrogen fluoride, hydrogen bromide and hydrogen iodide; bromine; heavy metals, such as mercury; and other compds.

IT 7439-97-6, **Mercury**;, processes 7726-95-6

, Bromine;,, processes

(**removed** together with SO₂; a method and a device for the sepn. of sulfur dioxide from a gas)

RN 7439-97-6 HCA

CN Mercury (8CI, 9CI) (CA INDEX NAME)

Hg

RN 7726-95-6 HCA

CN Bromine (8CI, 9CI) (CA INDEX NAME)

Br— Br

IC ICM B01D053-50
ICS B01D053-78

CC 59-4 (Air Pollution and Industrial Hygiene)

Section cross-reference(s): 47

ST **flue gas** desulfurization absorption lime
limestone apertured plate; sulfur dioxide removal **flue**
gas absorption lime apertured plate

IT Absorption

Flue gas desulfurization

(absorptive method and device for sepn. of SO₂ from a gas)

IT **Flue gases**

(boiler, desulfurization of; absorptive method and device for sepn. of SO₂ from a gas)

IT Metallurgy

Petroleum refining

(desulfurization of **flue gases** from;
absorptive method and device for sepn. of SO₂ from a gas)

IT Concrete

(prodn., desulfurization of **flue gases** from;
absorptive method and device for sepn. of SO₂ from a gas)

IT 7439-97-6, **Mercury**;, processes 7647-01-0,

Hydrogen chloride, processes 7664-39-3, Hydrogen fluoride,

processes 7726-95-6, Bromine;,, processes 10034-85-2,

Hydrogen iodide 10035-10-6, Hydrogen bromide, processes

(removed together with SO₂; a method and a device for the sepn. of sulfur dioxide from a gas)

L26 ANSWER 12 OF 26 HCA COPYRIGHT 2003 ACS on STN

137:357251 The fate and behavior of mercury in coal-fired

power plants. Meij, Ruud; Vredenbregt, Leo H. J.; te Winkel, Henk (KEMA Power Generation and Sustainables, Arnhem, Neth.). Journal of the Air & Waste Management Association, 52(8), 912-917 (English) 2002. CODEN: JAWAFC. ISSN: 1096-2247. Publisher: Air & Waste Management Association.

AB For the past 22 yr in the Netherlands, the behavior of Hg in coal-fired power plants has been studied extensively. Coal from all over the world is fired in Dutch power stations. First, the Hg concns. in these coals were measured. Second, the fate of the Hg during combustion was established by performing mass balance studies. On av., 43 .+- .30% of the Hg was present in the flue gases downstream of the electrostatic precipitator (ESP; dust collector). In individual cases, this figure can vary between 1 and 100%. Important parameters are the Cl content of the fuel and the flue gas temp. in the ESP. On av., 54 .+- .24% of the gaseous Hg was removed in the wet flue-gas desulfurization (FGD) systems, which are present at all Dutch coal-power stations. In individual cases, this removal can vary between 8% (outlier) and 72%. On av., the fate of Hg entering the power station in the coal was as follows: <1% in the bottom ash, 49% in the pulverized fuel ash (ash collected in the ESP), 16.6% in the FGD gypsum, 9% in the sludge of the wastewater treatment plant, 0.04% in the effluent of the wastewater treatment plant, 0.07% in fly dust (leaving the stack), and 25% as gaseous Hg in the flue gases and emitted into the air. The distribution of Hg over the streams leaving the FGD depends strongly on the installation. On av., 75% of the Hg was removed, and the final concn. of Hg in the emitted flue gases of the Dutch power stations was only .apprx.3 .mu.g/m³STP at 6% O₂. During co-combustion with biomass, the removal of Hg was similar to that during 100% coal firing. Speciation of Hg is a very important factor. An oxidized form (HgCl₂) favors a high degree of removal. The conversion from Hg₀ to HgCl₂ is pos. correlated with the Cl content of the fuel. A catalytic DENOX (SCR) favors the formation of oxidized Hg, and, in combination with a wet FGD, the total removal can be as high as 90%.

IT 7782-50-5, Chlorine, occurrence

(effects on fate and behavior of mercury in coal-fired power plants)

RN 7782-50-5 HCA

CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

CC 59-4 (Air Pollution and Industrial Hygiene)
ST chlorine effect mercury fate behavior **coal** fired power
plant
IT Air pollution
Combustion
(fate and behavior of mercury in **coal-fired** power
plants)
IT Coal, reactions
(fate and behavior of mercury in **coal-fired** power
plants)
IT Power
(plants, **coal-fired**; fate and behavior of mercury in)
IT 7782-50-5, Chlorine, occurrence
(effects on fate and behavior of mercury in **coal-fired**
power plants)
IT 7439-97-6, Mercury, processes
(fate and behavior of mercury in **coal-fired** power
plants)

L26 ANSWER 13 OF 26 HCA COPYRIGHT 2003 ACS on STN

137:173821 **Flue gas** Hg measurements from

coal-fired boilers equipped with wet scrubbers. DeVito, M.
S.; Withum, J. A.; Statnick, R. M. (Research and Development, CONSOL
Energy Inc., South Park, PA, 15129, USA). International Journal of
Environment and Pollution, 17(1/2), 126-142 (English) 2002. CODEN:
IJVLEN. ISSN: 0957-4352. Publisher: Inderscience Enterprises Ltd..

AB USEPA indicated it is considering addnl. SO₂ and NO_x emission
redns., and is under a consent agreement to propose Hg redn.
regulations by 2004 for the utility industry. Boiler manufacturers
and the utility industry developed improved combustion modification
techniques to reduce NO_x emissions. These advanced combustion
modification techniques plus selective catalytic redn. (SCR) offer
the potential to reduce NO_x emissions at reduced cost. Wet and dry
flue gas desulfurization (FGD) systems have been
shown to reduce SO₂ emissions by >95%. CONSOL showed that
conventional wet FGD and electrostatic precipitator (ESP) systems
can remove an av. of 67 +- 6% of inlet Hg. These data showed
utility boilers equipped with ESP-scrubber combinations are removing
2/3 of Hg in as-fired **coal** at no added cost. Hg
speciation data showed that 80-95% of oxidized Hg, as detd. by the
Ontario Hydro method, is removed by the scrubber. The av. Hg
material balance closure at 6 facilities was 103 +- 8%.

Hg removed by scrubbing is deposited in
the scrubber byproduct. Std. leachate testing conducted on fixed
and un-fixed scrubber byproduct from 1 test showed no Hg leaching.
Hg volatility was evaluated by heating scrubber byproduct
140.degree.F for 11 wk. After 11 wk, no Hg loss was reported.
Based on these results, there may be combinations of environmental
control systems which can achieve significant SO₂, NO_x, and Hg
redns. at lower cost than a conventional approach using 3 add-on
processes: FGD for SO₂ control, selective catalytic redn. for NO_x

control, and C injection for Hg control.
IT 7782-50-5, Chlorine, occurrence
(coal; mercury removal from
coal-fired power generation flue gas
by wet scrubbing flue gas desulfurization and
by combined electrostatic precipitators-wet flue
gas desulfurization)
RN 7782-50-5 HCA
CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl-Cl

CC 59-4 (Air Pollution and Industrial Hygiene)
Section cross-reference(s): 51, 60
ST flue gas emission coal fired
power generation USA; sulfur dioxide removal flue
gas wet scrubbing desulfurization; nitrogen oxide removal
flue gas selective catalytic redn; mercury
removal flue gas lime wet scrubbing
electrostatic precipitator
IT Ashes (residues)
(coal fly; mercury removal from
coal-fired power generation flue gas
by wet scrubbing flue gas desulfurization and
by combined electrostatic precipitators-wet flue
gas desulfurization)
IT Power
(coal-fired generation of; mercury
removal from coal-fired power generation
flue gas by wet scrubbing flue
gas desulfurization and by combined electrostatic
precipitators-wet flue gas desulfurization)
IT Flue gases
(coal-fired power generation; mercury
removal from coal-fired power generation
flue gas by wet scrubbing flue
gas desulfurization and by combined electrostatic
precipitators-wet flue gas desulfurization)
IT Ashes (residues)
Volatile substances
(coal; mercury removal from
coal-fired power generation flue gas
by wet scrubbing flue gas desulfurization and
by combined electrostatic precipitators-wet flue
gas desulfurization)
IT Air pollution
(control; mercury removal from coal
-fired power generation flue gas by wet
scrubbing flue gas desulfurization and by
combined electrostatic precipitators-wet flue
gas desulfurization)

IT Sludges
(**flue gas desulfurization; mercury removal from coal-fired power generation flue gas** by wet scrubbing **flue gas desulfurization** and by combined electrostatic precipitators-wet **flue gas desulfurization**)

IT Metal speciation
(**flue gas mercury; mercury removal from coal-fired power generation flue gas** by wet scrubbing **flue gas desulfurization** and by combined electrostatic precipitators-wet **flue gas desulfurization**)

IT Wet scrubbing
(lime slurry; **mercury removal from coal-fired power generation flue gas** by wet scrubbing **flue gas desulfurization** and by combined electrostatic precipitators-wet **flue gas desulfurization**)

IT Leaching
(mercury from sludge; **mercury removal from coal-fired power generation flue gas** by wet scrubbing **flue gas desulfurization** and by combined electrostatic precipitators-wet **flue gas desulfurization**)

IT Electrostatic precipitation apparatus
Flue gas desulfurization
(**mercury removal from coal-fired power generation flue gas** by wet scrubbing **flue gas desulfurization** and by combined electrostatic precipitators-wet **flue gas desulfurization**)

IT Coal, uses
(power generation from combustion of; **mercury removal from coal-fired power generation flue gas** by wet scrubbing **flue gas desulfurization** and by combined electrostatic precipitators-wet **flue gas desulfurization**)

IT Reduction
(selective catalytic; **mercury removal from coal-fired power generation flue gas** by wet scrubbing **flue gas desulfurization** and by combined electrostatic precipitators-wet **flue gas desulfurization**)

IT Lime (chemical)
(wet scrubbing with; **mercury removal from coal-fired power generation flue gas** by wet scrubbing **flue gas desulfurization** and by combined electrostatic precipitators-wet **flue gas desulfurization**)

IT 1333-74-0, Hydrogen, occurrence 7440-44-0, Carbon, occurrence 7727-37-9, Nitrogen, occurrence 7782-41-4, Fluorine, occurrence

7782-44-7, Oxygen, occurrence 7782-50-5, Chlorine, occurrence

(coal; mercury removal from coal-fired power generation flue gas by wet scrubbing flue gas desulfurization and by combined electrostatic precipitators-wet flue gas desulfurization)

IT 7704-34-9, Sulfur, occurrence
 (coal; total, pyritic, sulfate, and org.; mercury removal from coal-fired power generation flue gas by wet scrubbing flue gas desulfurization and by combined electrostatic precipitators-wet flue gas desulfurization)

IT 7439-97-6, Mercury, processes 7446-09-5, Sulfur dioxide, processes
 (mercury removal from coal-fired power generation flue gas by wet scrubbing flue gas desulfurization and by combined electrostatic precipitators-wet flue gas desulfurization)

IT 11104-93-1, Nitrogen oxide, processes
 (mercury removal from coal-fired power generation flue gas by wet scrubbing flue gas desulfurization and by combined electrostatic precipitators-wet flue gas desulfurization)

L26 ANSWER 14 OF 26 HCA COPYRIGHT 2003 ACS on STN

137:173707 Modeling of mercury states in coal-fired utility boilers. Chen, Z.; Senior, C. L.; Sarofim, A. F. (Reaction Engineering International, Salt Lake City, UT, 84101, USA). Proceedings of the International Technical Conference on Coal Utilization & Fuel Systems, 27th(Vol. 1), 549-560 (English) 2002. CODEN: PTCSFT. Publisher: Coal Technology Association.

AB Gas-phase oxidized mercury, particularly $HgCl_2$, is captured in wet scrubbers in combustion systems, while elemental mercury cannot. There is a wide range in the measured mercury capture efficiencies in scrubbers since the amt. of conversion of elemental mercury to oxidized mercury is a function of the chlorine content of the combustion gases and the temp. history. In order to look at the effects of realistic conditions in utility power plants, we created an av. time-temp. history based on a computational fluid dynamic (CFD) model of an actual coal-fired boiler. Results of the model in terms of fraction of elemental mercury in the flue gas at the air preheater outlet were compared with measured data. The model showed the correct trends of mercury oxidn. as a function of coal chlorine content. The oxidn. of elemental mercury was predicted to begin in the economizer and continue through the air preheater. The extent of oxidn. was related to the concn. of chlorine radical in the economizer, which was influenced by the cooling rate across the

economizer. Cooling rate and residence time in the **flue gas** in the temp. range from 900 K to 450 K (1160 F to 350 F) largely det. gas-phase mercury oxidn. Adding a long residence-time isothermal section after the economizer can increase the amt. of mercury oxidn. via gas-phase reactions. The modeling results suggest that gas-phase oxidn. may be responsible for some of the obsd. mercury oxidn. across SCR systems.

IT 7782-50-5, Chlorine, reactions
(oxidn. of mercury as function of **coal** chlorine content in modeling of mercury states in **coal-fired utility boilers**)
RN 7782-50-5 HCA
CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl—Cl

CC 59-2 (Air Pollution and Industrial Hygiene)
Section cross-reference(s): 51
ST air pollution modeling mercury state **coal** fired utility boiler
IT Boilers
(**coal-fired**, utility; modeling of mercury states in)
IT Simulation and Modeling, physicochemical
(computational fluid dynamics; of mercury states in **coal-fired** utility boilers)
IT Fluid dynamics
(computational; of mercury states in **coal-fired** utility boilers)
IT Fuels
(fossil; modeling of mercury states in **coal-fired** utility boilers)
IT Oxidation
(gas-phase; of mercury as function of **coal** chlorine content in modeling of mercury states in **coal-fired** utility boilers)
IT Air pollution
Flue gases
(modeling of mercury states in **coal-fired** utility boilers)
IT **Coal**, uses
(modeling of mercury states in **coal-fired** utility boilers)
IT Combustion
(modeling of mercury states in **coal-fired** utility boilers and **mercury** chloride **captured** in wet scrubbers in combustion systems)
IT Power
(plants; modeling of mercury states in **coal-fired** utility boilers)
IT Scrubbers
(wet; modeling of mercury states in **coal-fired** utility

boilers)

IT 7439-97-6, Mercury, reactions
(modeling of mercury states in coal-fired utility
boilers)

IT 7487-94-7, Mercury chloride (HgCl₂), occurrence
(modeling of mercury states in coal-fired utility
boilers and mercury chloride captured in wet
scrubbers in combustion systems)

IT 7782-50-5, Chlorine, reactions
(oxidn. of mercury as function of coal chlorine content
in modeling of mercury states in coal-fired utility
boilers)

L26 ANSWER 15 OF 26 HCA COPYRIGHT 2003 ACS on STN

136:10056 The effect of low-NOx burner operation on mercury emissions,
speciation, and removal at a coal fired boiler equipped
with wet FGD. DeVito, Matthew S. (Research & Development, CONSOL
Inc., Library, PA, 15129, USA). Proceedings - Annual International
Pittsburgh Coal Conference, 17th, 1278-1292 (English) 2000. CODEN:
PICNE4. ISSN: 1075-7961. Publisher: Pittsburgh Coal Conference,
University of Pittsburgh.

AB In a 1998 study co-funded by CONSOL Energy Inc., the Ohio
Coal Development Office and the US Department of Energy,
Hg emissions and removal from an eastern
bituminous coal-fired boiler operating with conventional
pulverized coal burners and equipped with a wet
flue gas desulfurization (FGD) system, were
measured. Results demonstrated a total Hg removal
(across the electrostatic precipitator [ESP] and FGD process) for
this unit of 64%, with 58% removal attributed to the FGD. At the
FGD inlet, 70-75% of Hg was in the oxidized form. Hg redn. across
the FGD was attributed to the removal of oxidized
Hg. Hg material balance closures were excellent and
confirmed that most of the Hg removed from
flue gas were in FGD solids, with a small
percentage in ESP ash. Leaching and volatility tests conducted on
these solids showed the Hg was stable. In 1999, the utility
installed low-NOx burners, which reduced NOx emissions by modifying
combustion conditions. This is accomplished by staging the
introduction of combustion air in and around the burner. Combustion
staging modifies the flame temp. profile, which impacts thermal NOx
formation. In theory, low-NOx burners can affect Hg emissions by
altering the oxidized:elemental Hg ratio. Changes in Hg speciation
will affect the Hg removal across FGD systems.
In some low-NOx burner installations, the C content of fly ash
increases. This could result in addnl. Hg capture
across the particulate control device. Since many utilities are
installing low-NOx burners as part of their NOx compliance strategy,
it is crit. to det. the effect of the burners on Hg
speciation, removal, and FGD chem. In Sept. 1999, a
second Hg emission measurement program was conducted at the host
utility. With the exception of retrofitted low-NOx burners, all

other system components remained const. This measurement program included Hg speciation, Hg removal across the ESP and FGD, Hg emissions, and Hg volatility and leachability in scrubber sludge. Results and a comparison to previous results are discussed.

IT 7782-50-5, Chlorine, occurrence
(coal contg.; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from coal-fired boilers equipped with wet flue gas desulfurization and electrostatic precipitator systems)

RN 7782-50-5 HCA

CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl-Cl

CC 59-4 (Air Pollution and Industrial Hygiene)
Section cross-reference(s): 51, 60

ST low nitrogen oxide burner effect coal combustion flue gas; mercury emission speciation removal coal combustion flue gas ; wet flue gas desulfurization mercury removal coal combustion gas; electrostatic precipitator mercury removal coal combustion flue gas

IT Metal speciation
(coal combustion mercury; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from coal-fired boilers equipped with wet flue gas desulfurization and electrostatic precipitator systems)

IT Ashes (residues)
(coal fly; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from coal-fired boilers equipped with wet flue gas desulfurization and electrostatic precipitator systems)

IT Power
(coal-fired generation of; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from coal-fired boilers equipped with wet flue gas desulfurization and electrostatic precipitator systems)

IT Air pollution
(control; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from coal-fired boilers equipped with wet flue gas desulfurization and electrostatic precipitator systems)

IT Ashes (residues)
(electrostatic precipitator; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from coal-fired boilers equipped with wet flue gas desulfurization and electrostatic precipitator systems)

IT Sludges
(**flue gas** desulfurization; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from **coal-fired** boilers equipped with wet **flue gas** desulfurization and electrostatic precipitator systems)

IT Electrostatic precipitation apparatus
(low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from **coal-fired** boilers equipped with wet **flue gas** desulfurization and electrostatic precipitator systems)

IT Burners
(low-nitrogen oxide; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from **coal-fired** boilers equipped with wet **flue gas** desulfurization and electrostatic precipitator systems)

IT **Flue gases**
(mercury in; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from **coal-fired** boilers equipped with wet **flue gas** desulfurization and electrostatic precipitator systems)

IT Mass balance
(mercury; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from **coal-fired** boilers equipped with wet **flue gas** desulfurization and electrostatic precipitator systems)

IT Bituminous **coal**
(power generation; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from **coal-fired** boilers equipped with wet **flue gas** desulfurization and electrostatic precipitator systems)

IT **Flue gas** desulfurization
(wet; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from **coal-fired** boilers equipped with wet **flue gas** desulfurization and electrostatic precipitator systems)

IT 1305-78-8, Calcium oxide, occurrence 1309-48-4, Magnesium oxide, occurrence 1344-28-1, Alumina, occurrence 7631-86-9, Silica, occurrence 11088-95-2, Iron oxide (FeO₃) 12136-45-7, Potassium oxide, occurrence
(**coal** ash contg.; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from **coal**-fired boilers equipped with wet **flue gas** desulfurization and electrostatic precipitator systems)

IT 1333-74-0, Hydrogen, occurrence 7704-34-9, Sulfur, occurrence 7727-37-9, Nitrogen, occurrence 7782-44-7, Oxygen, occurrence 7782-50-5, Chlorine, occurrence
(**coal** contg.; low-nitrogen oxide burners effect on mercury emissions, speciation, and removal from **coal**-fired boilers equipped with wet **flue gas** desulfurization and electrostatic precipitator systems)

IT 124-38-9, Carbon dioxide, occurrence 7446-09-5, Sulfur dioxide,

occurrence 11104-93-1, Nitrogen oxide, occurrence
 (low-nitrogen oxide burners effect on mercury emissions,
 speciation, and removal from coal-fired boilers
 equipped with wet flue gas desulfurization
 and electrostatic precipitator systems)

IT 7439-97-6, Mercury, processes
 (low-nitrogen oxide burners effect on mercury emissions,
 speciation, and removal from coal-fired boilers
 equipped with wet flue gas desulfurization
 and electrostatic precipitator systems)

IT 7440-44-0, Carbon, reactions
 (unburned coal fly ash; low-nitrogen oxide burners
 effect on mercury emissions, speciation, and removal from
 coal-fired boilers equipped with wet flue
 gas desulfurization and electrostatic precipitator
 systems)

L26 ANSWER 16 OF 26 HCA COPYRIGHT 2003 ACS on STN

136:10010 Mercury control by injection of activated carbon. Hargis,
 Richard A.; O'Dowd, William J.; Pennline, Henry W. (National Energy
 Technology Laboratory, U.S. Department of Energy, Pittsburgh, PA,
 15236, USA). Proceedings - Annual International Pittsburgh Coal
 Conference, 17th, 1235-1252 (English) 2000. CODEN: PICNE4. ISSN:
 1075-7961. Publisher: Pittsburgh Coal Conference, University of
 Pittsburgh.

AB Inhouse research at the National Energy Technol. Lab. (NETL) in the
 air toxics area has been directed at characterizing an existing
 pilot unit for distribution and fate of hazardous air pollutants,
 including Hg. This pilot unit is a 500-lb/h coal
 combustion system which includes a furnace, air pre-heater,
 ductwork, and pulse-jet fabric filter. Previous testing was
 conducted to evaluate Hg sampling and speciation methods. More
 recently, tests were conducted to initiate operation of a sorbent
 injection system. Following successful shakedown of the sorbent
 injection system, testing was conducted with a low-S (.apprx.1%)
 bituminous coal. Hg measurements were made using the ASTM
 draft Hg speciation (Ontario-Hydro) method and a total Hg
 measurement method (EPA Method 101A). For comparison, measurements
 were also made with a continuous emissions monitor and a solid
 sorbent sampling technique. Results presented are from test
 conditions with injection of Norit Darco activated C (AC) at various
 sorbent:Hg mass ratios (.apprx.1,800:1 to .apprx.10,300:1) and
 Calgon FluePac at ratios of 2,600:1 and 5,200:1. Three av. baghouse
 temps. were studied: 250, 270, and 300.degree.F. Results included
 Hg removal efficiency, vapor-solid distribution,
 speciation, and material balances. Future testing is planned to
 continue with Norit Darco and other activated C and novel sorbents.

IT 7782-50-5, Chlorine, occurrence
 (coal contg.; temp., baghouse filter parameters,
 combustor operating conditions, and fly ash coal
 content effect on mercury removal from
 coal combustion flue gas by injected

RN activated carbon sorbent)
7782-50-5 HCA
CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl-Cl

CC 59-2 (Air Pollution and Industrial Hygiene)
Section cross-reference(s): 51, 60
ST coal combustion flue gas mercury
control; activated carbon injection flue gas
mercury control; sorbent injection flue gas
mercury control
IT Filters
(bags; temp., baghouse filter parameters, combustor operating
conditions, and fly ash coal content effect on
mercury removal from coal combustion
flue gas by injected activated carbon sorbent)

IT Mass balance
Metal speciation
(coal combustion flue gas
mercury; temp., baghouse filter parameters,
combustor operating conditions, and fly ash coal
content effect on mercury removal from
coal combustion flue gas by injected
activated carbon sorbent)

IT Flue gases
(coal combustion; temp., baghouse filter parameters,
combustor operating conditions, and fly ash coal
content effect on mercury removal from
coal combustion flue gas by injected
activated carbon sorbent)

IT Ashes (residues)
(coal contg.; temp., baghouse filter parameters,
combustor operating conditions, and fly ash coal
content effect on mercury removal from
coal combustion flue gas by injected
activated carbon sorbent)

IT Ashes (residues)
(coal fly; temp., baghouse filter parameters, combustor
operating conditions, and fly ash coal content effect
on mercury removal from coal
combustion flue gas by injected activated
carbon sorbent)

IT Power
(coal-fired generation of; temp., baghouse filter
parameters, combustor operating conditions, and fly ash
coal content effect on mercury removal
from coal combustion flue gas by
injected activated carbon sorbent)

IT Bituminous coal
(low-sulfur; power generation from combustion of; temp., baghouse

filter parameters, combustor operating conditions, and fly ash
coal content effect on **mercury removal**
 from **coal** combustion **flue gas** by
 injected activated carbon sorbent)

IT 7440-44-0, Carbon, uses
 (activated; sorbent; temp., baghouse filter parameters, combustor
 operating conditions, and fly ash **coal** content effect
 on **mercury removal** from **coal**
 combustion **flue gas** by injected activated
 carbon sorbent)

IT 1333-74-0, Hydrogen, occurrence 7704-34-9, Sulfur, occurrence
 7727-37-9, Nitrogen, occurrence 7782-44-7, Oxygen, occurrence
 7782-50-5, Chlorine, occurrence
 (**coal** contg.; temp., baghouse filter parameters,
 combustor operating conditions, and fly ash **coal**
 content effect on **mercury removal** from
coal combustion **flue gas** by injected
 activated carbon sorbent)

IT 7439-97-6, Mercury, processes
 (temp., baghouse filter parameters, combustor operating
 conditions, and fly ash **coal** content effect on
mercury removal from **coal** combustion
flue gas by injected activated carbon sorbent)

L26 ANSWER 17 OF 26 HCA COPYRIGHT 2003 ACS on STN
 134:299840 The capture and determination of mercury species from
coal combustion emissions using iodine based impingers and
 direct injection nebulization - inductively coupled plasma mass
 spectrometry analysis. Hedrick, Elizabeth (U.S. EPA, Cincinnati,
 OH, USA). Preprints of Extended Abstracts presented at the ACS
 National Meeting, American Chemical Society, Division of
 Environmental Chemistry, 41(1), 807-810 (English) 2001. CODEN:
 PEACF2. ISSN: 1524-6434. Publisher: American Chemical Society,
 Division of Environmental Chemistry.

AB Gaseous Hg species in **flue gas** are detd. using
 USEPA Method 5 sampling. In this sampling, a hole is drilled into
 the stack wall and a vol. of gas is isokinetically drawn through a
 heated probe, through a filter to remove particles, and through a
 series of gas scrubbing solns. designed to selectively
capture gaseous Hg species. Gaseous speciation is
 achieved by selective, sequential capture in the impinger solns.
 Anal. of Hg on the **filter** and in impinger solns.
 is done by oxidizing all Hg species and analyzing with cold vapor
 at. absorption spectrometry. In this work, an impinger sampling
 train for Hg speciation was developed which uses tris buffer to
capture oxidized Hg and aq. I to **capture**
 elemental Hg. The elegance of this approach is in the
 generation of I just prior to sampling to **capture**
 elemental Hg and low-level measurement of all Hg species
 using inductively coupled plasma mass spectrometry (ICP-MS) with
 direct injection nebulization (DIN). This work evaluated impinger
 solns. amenable to DIN-ICP-MS which may be used to **capture**

gaseous oxidized Hg; developed an impinger soln. to capture Hg₀ amenable to DIN-ICP-MS; developed an EPA Method 5-type sampling train of impingers for low-level Hg speciation which are completely amenable to DIN-ICP-MS; and tested proposed impingers for Hg speciation against the Ontario Hydro Method in the bench scale combustion of an Ohio bituminous coal.

IT 7553-56-2, Iodine, reactions

(aq.; capture and detn. of mercury in coal combustion emissions using iodine-based impingers and direct injection nebulization-inductively coupled plasma-mass spectrometry)

RN 7553-56-2 HCA

CN Iodine (8CI, 9CI) (CA INDEX NAME)

I—I

CC 59-1 (Air Pollution and Industrial Hygiene)

Section cross-reference(s): 51, 79

ST elemental oxidized mercury detn coal combustion flue gas; direct injection nebulization-inductively coupled plasma mass spectrometry

IT Gas analysis

(coal combustion flue gas; capture and detn. of mercury in coal combustion emissions using iodine-based impingers and direct injection nebulization-inductively coupled plasma-mass spectrometry)

IT Flue gases

(coal combustion; capture and detn. of mercury in coal combustion emissions using iodine-based impingers and direct injection nebulization-inductively coupled plasma-mass spectrometry)

IT 7722-84-1, Hydrogen peroxide, uses

(acidified; impinger soln.; capture and detn. of mercury in coal combustion emissions using iodine-based impingers and direct injection nebulization-inductively coupled plasma-mass spectrometry)

IT 7553-56-2, Iodine, reactions

(aq.; capture and detn. of mercury in coal combustion emissions using iodine-based impingers and direct injection nebulization-inductively coupled plasma-mass spectrometry)

IT 77-86-1, Tris buffer

(impinger soln.; capture and detn. of mercury in coal combustion emissions using iodine-based impingers and direct injection nebulization-inductively coupled plasma-mass spectrometry)

IT 7439-97-6, Mercury, analysis

(oxidized and elemental; capture and detn. of mercury in coal combustion emissions using iodine-based impingers and direct injection nebulization-inductively coupled plasma-mass spectrometry)

133:197454 Review of recent studies on mercury in the atmosphere.
 Marumoto, Koji; Sakata, Masahiro (Central Research Institute of Electric Power Industry, Komae Research Laboratory, Iwado-kita, Komae-shi, Tokyo, 201-8511, Japan). Chikyu Kagaku (Nippon Chikyu Kagakkai), 34(2), 59-75 (Japanese) 2000. CODEN: CKNKDM. ISSN: 0386-4073. Publisher: Nippon Chikyu Kagakkai.

AB This review, with many refs., presents the conclusions of recent international studies pertaining to the speciation, emission sources, and fate of mercury in the atm. The background level of total gaseous mercury concn. in the air is 1-3 ng/m³. Mercury takes various phys. and chem. forms in the atm., mainly gaseous elemental mercury [Hg(0)], gaseous divalent mercury [Hg(II)], and particulate mercury [Hg(p)]. Hg(0) is the dominant form of mercury in the atm., and the concns. of Hg(II) and Hg(p) are generally only a few percent of the total concn. of airborne mercury. Because these three species have different characteristics with respect to transport, deposition, and influences on ecosystems, mercury speciation measurements are of great importance. Mercury is emitted from natural and anthropogenic sources. Natural sources include volcanic activity and emission from sea, soil, and vegetation surfaces. Anthropogenic sources include coal combustion, waste incineration, and nonferrous metal refining and smelting. Mercury emitted from these sources into the atm. is removed by wet and dry deposition. Wet deposition is the main process of **mercury removal** from the atm. In this process, atm. oxidn. processes in which Hg(0) is converted to Hg(II) by O₃, H₂O₂, and Cl₂ play important roles.

CC 59-0 (Air Pollution and Industrial Hygiene)
 Section cross-reference(s): 51, 53, 54, 61

IT Air pollution
 Airborne particles
 Atmosphere (earth)
 Environmental transport
Flue gases
 Incineration
 Water pollution
 (atm. mercury source, speciation, and fate)

IT **Flue gases**
 (incinerator; atm. mercury source, speciation, and fate)

L26 ANSWER 19 OF 26 HCA COPYRIGHT 2003 ACS on STN

133:33858 Mercury control research: effects of fly ash and **flue gas** parameters on mercury speciation. Lee, Chun Wai; Kilgroe, James D.; Ghorishi, S. Behrooz (National Risk Management Research Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC, USA). Annual Waste-to-Energy Conference, Proceedings of a Specialty Conference, 6th, Miami Beach, FL, United States, May 11-13, 1998, 221-238. Air & Waste Management Association: Pittsburgh, Pa. (English) 1998. CODEN: 69AAXQ.

AB In **flue gas** from combustion systems, mercury (Hg) is typically in the vapor phase at **flue gas** cleaning temps., and the control of Hg emissions is dependent on the

specific Hg compds. that are present (speciation) and the type of air pollution devices employed. In dry and semi-dry scrubbing systems, the control of Hg emissions is dependent on the sorption of Hg by particulate matter (PM) which can be subsequently collected in a PM control device. In wet scrubbing systems, the principal mechanisms of control are the removal of sol. forms of Hg and the collection of particle-bound Hg. At combustion temps., Hg is believed to be predominantly in the form of elemental mercury (Hg_0). As the **flue gas** is cooled, thermochem. equil.

calcns. indicate that Hg_0 is converted primarily to ionic mercury (Hg^{++}) in the form of mercuric oxide (HgO) or mercuric chloride ($HgCl_2$). Hg_0 is insol. in water, but HgO has a low solv. while $HgCl_2$ is highly sol. The oxidn. of Hg_0 to an ionic form depends on the temp., the time-temp. profile, the **flue gas** compn., the reaction kinetics, and the presence of solids that may catalyze reactions. Bench-scale expts. were conducted to study the effects of **flue gas** and fly ash parameters on

the oxidn. of Hg_0 in simulated **flue gases** contg.

hydrogen chloride (HCl). Gas-phase studies indicated that the in-flight post-combustion oxidn. of Hg_0 in the presence of HCl is very slow and proceeds at measurable rates only at high temps.

($>700.\text{degree.C}$) and high HCl concns. ($>200 \text{ ppm}$). The presence of sulfur dioxide (SO_2) and water vapor in the simulated **flue gas** significantly inhibited the gas-phase oxidn. of Hg_0 . On the other hand, a preliminary investigation indicated that the

gas-phase reaction of Hg_0 with chlorine (Cl_2) is fast.

At $40.\text{degree.C}$ and in the presence of $50 \text{ ppm } Cl_2$, 100% of the input Hg_0 was oxidized to $HgCl_2$ in less than 2 s, indicating that

Cl_2 is a much more active chlorinating agent than HCl. The

effects of fly ash compn. were investigated using a fixed-bed

reactor contg. different model fly ashes (simulated fly ash)

consisting of mixts. of some major components found in **coal**

and municipal waste combustor (MWC) fly ashes. Work to date has

focused on the potential catalytic oxidn. of Hg_0 by two- and three-component model fly ashes composed of mixts. of: Al_2O_3 , SiO_2 ,

Fe_2O_3 , CuO , and CaO . Copper and iron oxides were the only two

components that exhibited significant catalytic activity in the

surface-mediated oxidn. of Hg_0 . The reactivity of these two metals

is hypothesized to be affected through the formation of a

chlorinating agent (most probably Cl_2) from gas-phase HCl

on the surface of metal oxides (the Deacon process reaction).

Copper was much more effective in the oxidn. of Hg_0 than iron, and

its catalytic activity was less sensitive to the presence of oxidn. inhibitors (SO_2 and water vapor). The presence of a small quantity

of CuO (0.1% wt) in the model fly ash caused a 95% oxidn. of Hg_0 in

the temp. range of 150 to $250.\text{degree.C}$. The same extent of Hg

oxidn. was obtained by adding 14% (wt) Fe_2O_3 to the model fly ash.

CC 59-4 (Air Pollution and Industrial Hygiene)

Section cross-reference(s): 60

ST mercury control **flue gas** scrubbing; fly ash

flue gas parameter mercury

removal scrubbing

IT Air pollution
(control; mercury control in **flue gas**
scrubbing systems: effects of fly ash and **flue**
gas parameters on mercury speciation)

IT Municipal refuse
(**flue gases** from incineration of; mercury
control in **flue gas** scrubbing systems:
effects of fly ash and **flue gas** parameters on
mercury speciation)

IT Ashes (residues)
(fly; mercury control in **flue gas** scrubbing
systems: effects of fly ash and **flue gas**
parameters on mercury speciation)

IT Dry scrubbing
Flue gases
Reaction kinetics
Simulation and Modeling, physicochemical
Waste incineration
Wet scrubbing
(**mercury** control in **flue gas**
scrubbing systems: effects of fly ash and **flue**
gas parameters on mercury speciation)

IT Water vapor
(mercury oxidn. in presence of; mercury control in **flue**
gas scrubbing systems: effects of fly ash and
flue gas parameters on mercury speciation)

IT 7446-09-5, Sulfur dioxide, reactions 7647-01-0, Hydrochloric acid,
reactions
(**flue gases** contg.; mercury control in
flue gas scrubbing systems: effects of fly ash
and **flue gas** parameters on mercury
speciation)

IT 1305-78-8, Calcium oxide (CaO), miscellaneous 1309-37-1, Iron
oxide (Fe₂O₃), miscellaneous 1317-38-0, Copper oxide (CuO),
miscellaneous 1344-28-1, Aluminum oxide (Al₂O₃), miscellaneous
7631-86-9, Silica, miscellaneous
(in fly ash; mercury control in **flue gas**
scrubbing systems: effects of fly ash and **flue**
gas parameters on mercury speciation)

IT 7487-94-7, Mercury chloride, processes 21908-53-2, Mercury oxide
(HgO)
(mercury control in **flue gas** scrubbing
systems: effects of fly ash and **flue gas**
parameters on mercury speciation)

IT 7439-97-6, Mercury, processes
(mercury control in **flue gas** scrubbing
systems: effects of fly ash and **flue gas**
parameters on mercury speciation)

IT 7732-18-5, Water, reactions
(vapor; mercury control in **flue gas** scrubbing
systems: effects of fly ash and **flue gas**
parameters on mercury speciation)

L26 ANSWER 20 OF 26 HCA COPYRIGHT 2003 ACS on STN
130:300892 Wet scrubbing with an oxidizing solution for **removal**
of elemental **mercury** from a **flue-gas**
stream. Mendelsohn, Marshall H.; Huang, Hann-sheng (United States
Dept. of Energy, USA). U.S. US 5900042 A 19990504, 9 pp.
(English). CODEN: USXXAM. APPLICATION: US 1997-912582 19970818.

AB The Hg vapor in a gas stream is removed by wet scrubbing or a similar contact with aq. oxidizing soln. to convert the elemental Hg to sol. compds. The aq. oxidizing solns. contain I, Br, Cl, HCLO₃, and/or chlorates, and are suitable for wet scrubbing of **coal**-combustion **flue gas** contg. Hg vapor. Exptl. **removal of Hg** was 71.1% when the Hg vapor in flowing air was injected into aq. soln. contg. 250 ppm Br, vs. <1% removal by aq. scrubbing.

IT 7553-56-2, Iodine, processes 7726-95-6, Bromine, processes 7782-50-5, Chlorine, processes (scrubber soln. with; wet scrubbing with aq. oxidizing soln. for **removal of mercury from flue-gas stream**)

RN 7553-56-2 HCA
CN Iodine (8CI, 9CI) (CA INDEX NAME)

I-- I

RN 7726-95-6 HCA
CN Bromine (8CI, 9CI) (CA INDEX NAME)

Br-- Br

RN 7782-50-5 HCA
CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl-- Cl

IC ICM C22B003-10
NCL 075742000
CC 59-4 (Air Pollution and Industrial Hygiene)
Section cross-reference(s): 51
ST **mercury vapor removal** gas scrubbing oxidizing
soln; bromine aq **scrubbing flue gas**
mercury removal
IT Alkali metal compounds
(chlorates, scrubber soln. with; wet scrubbing with aq. oxidizing
soln. for **removal of mercury from**
flue-gas stream)
IT **Scrubbers**
(**mercury removal** by; wet scrubbing with aq.
oxidizing soln. for **removal of mercury from**

IT flue-gas stream)

IT Flue gases
(mercury removal from; wet scrubbing with aq.
oxidizing soln. for removal of mercury from
flue-gas stream)

IT 124-38-9, Carbon dioxide, uses 7446-09-5, Sulfur dioxide, uses
10102-43-9, Nitrogen oxide (NO), uses
(flue gas contg., scrubbing of; wet scrubbing
with aq. oxidizing soln. for removal of mercury
vapor from flue gas)

IT 7553-56-2, Iodine, processes 7726-95-6, Bromine,
processes 7782-50-5, Chlorine, processes 7790-93-4,
Chloric acid
(scrubber soln. with; wet scrubbing with aq. oxidizing soln. for
removal of mercury from flue-
gas stream)

IT 7439-97-6, Mercury, processes
(vapor; wet scrubbing with aq. oxidizing soln. for
removal of mercury from flue-
gas stream)

L26 ANSWER 21 OF 26 HCA COPYRIGHT 2003 ACS on STN

130:56272 XAFS Examination of Mercury Sorption on Three Activated Carbons. Huggins, Frank E.; Huffman, Gerald P.; Dunham, Grant E.; Senior, Constance L. (CME/CFFLS, University of Kentucky, Lexington, KY, 40506-0043, USA). Energy & Fuels, 13(1), 114-121 (English) 1999. CODEN: ENFUEM. ISSN: 0887-0624. Publisher: American Chemical Society.

AB The sorption of mercury, as HgO and $HgCl_2$, in a synthetic flue gas (SFG) by three activated carbons has been examd. by XAFS spectroscopy. The three carbons consisted of a sulfur-activated carbon, an iodine-activated carbon, and an activated carbon derived from lignite. In addn. to mercury, the occurrence and behavior of sulfur, chlorine, calcium, and iodine were also examd. by XAFS spectroscopy. These other elements were present either as activating species on the carbons or as reactive components (SO_2 , HCl) in the SFG. The XAFS results showed that each type of activated carbon behaves differently with respect to sorption of mercury and other species from the SFG. For the iodine- and sulfur-activated carbons, the XAFS data confirm that it is the activating element (I or S) that forms a sorption complex with mercury. However, the activated carbon from lignite exhibited a more variable behavior that reflected the conditions of the expts., in particular whether HCl or $HgCl_2$ was present in the SFG. This study reveals some of the complexities that are involved in low-temp. sorption of mercury by activated carbons in that the sorption mechanism clearly involves acidic species of sulfur and chlorine in the gas phase, the affinity of the carbon for such species, and the nature of the active sites on the carbons, in addn. to the mercury speciation.

IT 7553-56-2, Iodine, processes 7782-50-5, Chlorine,
processes

(XAFS examn. of mercury sorption on activated carbons)

RN 7553-56-2 HCA

CN Iodine (8CI, 9CI) (CA INDEX NAME)

I-I

RN 7782-50-5 HCA

CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl-Cl

CC 59-4 (Air Pollution and Industrial Hygiene)
Section cross-reference(s): 73

IT **Flue gases**

(from coal combustion, **mercury removal** from; XAFS examn. of mercury sorption on activated carbons in relation to)

IT 7440-70-2, Calcium, processes 7446-09-5, Sulfur dioxide, processes 7553-56-2, Iodine, processes 7647-01-0, Hydrochloric acid, processes 7704-34-9, Sulfur, processes 7782-50-5, Chlorine, processes

(XAFS examn. of mercury sorption on activated carbons)

L26 ANSWER 22 OF 26 HCA COPYRIGHT 2003 ACS on STN

130:28621 Mercury-chlorine-fly ash interactions in a **coal** combustion **flue gas**. Galbreath, Kevin C.;

Zygarlickie, Christopher J.; Toman, Donald L. (Energy & Environmental Research Center, Grand Forks, ND, 58202-9018, USA). Proceedings, Annual Meeting - Air & Waste Management Association, 91st, RA79B08/1-RA79B08/15 (English) 1998. CODEN: PAMEE5. ISSN: 1052-6102. Publisher: Air & Waste Management Association.

AB Hg-Cl-fly ash interactions were investigated using a 42-MJ/h **coal** combustion system. Ten μg Hg(g)/m³ and 100 ppm by vol. (ppmv) HCl(g) were injected into a simple 1250.degree. gas mixt. (8.5 mol% O₂, 91.5 mol% N₂). In addn., a Powder River Basin subbituminous **coal** from the Absaloka mine (0.052 \pm 0.005 ppm Hg, 50 \pm 10 ppm Cl) was burned at an excess O₂ of 8.5 mol% while 50- and 100-ppmv HCl(g) were injected into the furnace at 1330.degree.. Hg and Cl speciation analyses of the resulting **flue gases** were performed at 200.degree. or 250.degree.. **Flue gas** residence time in the combustor was approx. 2.5 s. Baseline testing indicated that 50% of the Hg₀(g) spike was transformed to a gaseous mercuric compd. (Hg₂+X[g]), possibly through a catalyzed Hg₀(g)-O₂ (g) reaction involving a refractory metal oxide compd. Low recoveries of Hg₀(g) and the formation of Cl₂(g) during 100-ppmv HCl(g) spike tests into the gas mixt. suggest that HgCl₂(s,l) was formed and deposited in the combustor. Baseline testing of Absaloka **coal** indicated that on av. 41%, 19%, and 40% of the total Hg (5.5 \pm 0.6 $\mu\text{g}/\text{m}^3$) were present as particle-assocd. mercury

(Hg[p]), Hg₂₊X(g), and HgO(g), resp. Relatively high Hg(p) concns. are consistent with previous measurements, thus corroborating the enhanced Hg sorption capacity of Absaloka fly ash. Cl detns. in the flue gas and fly ash indicate that HCl(g) was scavenged by ash particles. The formation of particle-assocd. Cl, however, inhibited Hg-fly ash sorption. This inhibition effect is consistent with exptl. investigations of lime (CaO[s])-based sorbents for Hg and HCl(g) control, thus suggesting that CaO(s) is an important Hg-sorption component of Absaloka fly ash. X-ray diffraction analyses confirm that CaO(s) is a major component of Absaloka fly ash.

IT 7782-50-5, Chlorine, reactions
(mercury-chlorine-fly ash interactions in a coal combustion flue gas in relation to)

RN 7782-50-5 HCA

CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl-Cl

CC 59-4 (Air Pollution and Industrial Hygiene)
Section cross-reference(s): 51

ST mercury chlorine fly ash interaction coal flue gas; sorption mercury fly ash coal flue gas

IT Ashes (residues)
(coal fly; mercury-chlorine-fly ash interactions in a coal combustion flue gas)

IT Sorbents
(lime and fly ash; mercury-chlorine-fly ash interactions in a coal combustion flue gas in relation to mercury removal with lime and fly ash)

IT Lime (chemical)
(mercury sorption by; mercury-chlorine-fly ash interactions in a coal combustion flue gas in relation to mercury removal with lime)

IT Flue gases
(mercury-chlorine-fly ash interactions in a coal combustion flue gas)

IT Sorption
(of mercury in flue gas; mercury-chlorine-fly ash interactions in a coal combustion flue gas in relation to)

IT 7439-97-6, Mercury, reactions
(mercury-chlorine-fly ash interactions in a coal combustion flue gas)

IT 7647-01-0, Hydrochloric acid, reactions
(mercury-chlorine-fly ash interactions in a coal combustion flue gas in relation to)

IT 7782-50-5, Chlorine, reactions
(mercury-chlorine-fly ash interactions in a coal combustion flue gas in relation to)

IT 7487-94-7, Mercury chloride (HgCl₂), formation (nonpreparative) (mercury-chlorine-fly ash interactions in a **coal** combustion **flue gas** in relation to formation of)

L26 ANSWER 23 OF 26 HCA COPYRIGHT 2003 ACS on STN

124:65058 Laboratory-scale investigation of sorbents for mercury control. Miller, Stanley J.; Laudal, Dennis L.; Chang, Ramsay; Bergman, Perry D. (Energy and Environmental Research Center, Grand Forks, ND, USA). Proceedings, Annual Meeting - Air & Waste Management Association, 87th(Vol. 6A, Air Pollution Sources & Control), 1-15, Paper 94-RA114A.01 (English) 1994. CODEN: PAMEE5. ISSN: 1052-6102. Publisher: Air & Waste Management Association.

AB The removal of Hg from coal-firing power plant **flue gases** was developed. The inlet Hg speciation for the Absaloka subbituminous and Blacksville bituminous **coal** was significantly different. Less Hg was retained in the baghouse hopper ash with the bituminous **coal** even though the oxidized Hg and loss-on-ignition were much higher. An I-impregnated activated carbon provided effective Hg adsorber at 150-200.degree. but the oxidized **Hg removal** takes place at lower temps.

IT 7553-56-2, Iodine, uses (iodine impregnated activated carbon; lab.-scale investigation of sorbents for **mercury removal** from sub- and bituminous **coal** combustion)

RN 7553-56-2 HCA

CN Iodine (8CI, 9CI) (CA INDEX NAME)

I—I

CC 59-4 (Air Pollution and Industrial Hygiene)
Section cross-reference(s): 52

ST **mercury removal coal flue**
gas; bituminous coal flue gas
mercury removal; subbituminous coal
flue gas mercury removal;
sorbent mercury coal flue gas;
activated carbon iodine treated sorbent

IT **Flue gases**
(lab.-scale investigation of sorbents for **mercury removal** from sub- and bituminous **coal** combustion)

IT **Coal**
(subbituminous, bituminous; lab.-scale investigation of sorbents for **mercury removal** from sub- and bituminous **coal** combustion)

IT 7553-56-2, Iodine, uses (iodine impregnated activated carbon; lab.-scale investigation of sorbents for **mercury removal** from sub- and bituminous **coal** combustion)

IT 7440-44-0, Carbon, uses
 (iodine impregnated activated; lab.-scale investigation of sorbents for **mercury removal** from sub- and bituminous **coal** combustion)

IT 7439-97-6, Mercury, processes
 (lab.-scale investigation of sorbents for **mercury removal** from sub- and bituminous **coal** combustion)

L26 ANSWER 24 OF 26 HCA COPYRIGHT 2003 ACS on STN
 113:237057 Carbon-containing wastes from **coal** vortex
 combustion at a heat and electric power plant as adsorbents of mercury-containing anions from dechlorinated brines. Kochetkova, R. P.; Sorkin, E. I.; Shiverskaya, I. P.; Voronkov, V. V.; Apasov, V. L.; Polyakov, V. V. (Inst. Nefte- Uglekhim. Sint., Irkutsk, USSR). Zhurnal Prikladnoi Khimii (Sankt-Peterburg, Russian Federation), 63(8), 1684-8 (Russian) 1990. CODEN: ZPKHAB. ISSN: 0044-4618.

AB Coke particles from low-temp. vortex combustion of brown **coal** had anion-exchange properties and after activation in fluidized bed by steam and CO₂, which enhanced the properties, could be used as adsorbent for the removal of [HgCl_n]_{2-n} from chloralkali plant wastewater. The anion-exchange properties of the adsorbent were adversely affected by oxidative treatment but could be restored after thermal treatment in an inert gas atm.

IT 7782-50-5P, Chlorine, preparation
 (manuf. of, in chloralkali plant, wastewater from, complex **mercury anion removal** from, by carbonaceous wastes from brown **coal** combustion)

RN 7782-50-5 HCA

CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl—Cl

CC 60-2 (Waste Treatment and Disposal)
 Section cross-reference(s): 49

ST **mercury removal** chloralkali wastewater; brown **coal** coke mercury adsorbent

IT Waste solids
 (carbonaceous residues from brown **coal** combustion, in treatment of chloralkali plant wastewater for complex **mercury anion removal**)

IT Wastewater treatment
 (adsorption, of chloralkali plant **effluents** for complex **mercury anion removal**, carbonaceous wastes from brown **coal** combustion in)

IT Coke
 (brown-coal, waste, in treatment of chloralkali plant wastewater for complex **mercury anion removal**)

IT 1310-73-2P, Sodium hydroxide, preparation 7782-50-5P,
 Chlorine, preparation
 (manuf. of, in chloralkali plant, wastewater from, complex

mercury anion removal from, by carbonaceous wastes from brown coal combustion)

IT 51312-24-4, **Mercury chloride**
 (removal of, from chloralkali plant wastewater, carbonaceous wastes from brown coal combustion in)

L26 ANSWER 25 OF 26 HCA COPYRIGHT 2003 ACS on STN

81:82121 **Recovery of mercury from mercurous bearing liquids.** Gerow, Raymond F.; Soule, Stanley B. (GAF Corp.). U.S. US 3802910 19740409, 6 pp. (English). CODEN: USXXAM. APPLICATION: US 1972-243478 19720412.

AB By bringing an aq. effluent having a pH 2-11 and contg. 1-500 ppm dissolved or metallic Hg into ultimate contact with a H₂O-stable solid metallic reducing agent having a greater soln. potential than Hg, elemental Hg is removed. The liberated Hg amalgamates on the surface of the reducing agent and also coalesces into droplets. The resulting impure Hg is purified by acid washing or retorting. Zn-coated graphite particles are used as the reducing agent. The method is applicable to the recovery of Hg from the aq. brine effluent of a Cl-producing cell using a Hg cathode.

IT 7782-50-5P, preparation
 (brine from manuf. of, mercury removal from, zinc-coated graphite in)

RN 7782-50-5 HCA

CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

Cl—Cl

IT 7439-97-6P, preparation
 (recovery of, from electrolytic brine by zinc-coated graphite)

RN 7439-97-6 HCA

CN Mercury (8CI, 9CI) (CA INDEX NAME)

Hg

IC C23C
 NCL 117100000M
 CC 60-2 (Sewage and Wastes)
 Section cross-reference(s): 49, 54
 ST **mercury recovery** brine amalgam; chlorine manuf
mercury recovery
 IT Brines
 (mercury removal from, from chlorine manuf., zinc-coated graphite in)

IT 7782-50-5P, preparation
 (brine from manuf. of, mercury removal from, zinc-coated graphite in)

IT 7440-66-6, uses and miscellaneous

(graphite coated by, **mercury recovery** by,
from electrolytic brine)

IT 7439-97-6P, preparation
(**recovery** of, from electrolytic brine by zinc-coated
graphite)

IT 7782-42-5, uses and miscellaneous
(zinc-coated, **mercury removal** by, from
electrolytic brine)

L26 ANSWER 26 OF 26 HCA COPYRIGHT 2003 ACS on STN
78:140014 Reuse of waste water in chemical industries. Shinagawa,
Toshiyoshi (Sansei Dev. Co., Ltd., Japan). Nenryo oyobi Nensho,
39(12), 1185-92 (Japanese) 1972. CODEN: NEONAA. ISSN: 0369-3783.
AB Cooling water used in **coal** chem. complexes in Omuta,
Japan, was recovered with spray ponds, cooling towers, etc. The
reuse of water in an electrolytic plant (electrolysis of NaCl by the
Hg process) involved **recovery** of cooling water for
H and Cl, and of wash water for the electrolytic cells. In an
agrochem. plant manufg. Na pentachlorophenolate, the wash water for
a neutralizer was recovered and recycled as a scrubber for the gas
effluent. Treatment of Hg waste water and activated sludge
treatment of phenolic waste water are also discussed.

IT 7782-50-5P, preparation
(waste water from manuf. of, treatment of, for reuse)

RN 7782-50-5 HCA

CN Chlorine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

C1-C1

CC 60-2 (Sewage and Wastes)
Section cross-reference(s): 5, 52, 77

ST water reuse **coal** chem complex; electrolytic plant water
reuse; agrochem plant water reuse

IT **Coal**
(chem. products manufd. from, treatment of waste water from, for
reuse)

IT 131-52-2P 1310-73-2P, preparation 7782-50-5P,
preparation
(waste water from manuf. of, treatment of, for reuse)